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Police Emergency Driving Instruction Program Evaluation

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POLICE EMERGENCY DRIVING INSTRUCTION

PROGRAM EVALUATION

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This field study submitted by John W. Palmer in partial fulfillment of the requirements for the Degree of Specialist at St. Cloud State University is hereby approved by the final evaluation committee.

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POLICE EMERGENCY DRIVING INSTRUCTION
PROGRAM EVALUATION

John W. Palmer

This study attempts to answer the basic question, "Does practice and instruction in simulated emergency situations lead to improvement in the driving performance of the treated subjects, as related to accident reduction?"

As a group of drivers, police officers receive little or no special preparation in driving skills. With preparation minimal, it would follow that police officers who are confronted with emergency situations will often respond incorrectly and collisions will be the result. Training can, therefore, eliminate many accidents.

The study at St. Cloud State University was limited to comparisons between two groups of Minnesota Police Officers. The experimental group received three days of instruction which involved classroom and driving experience. Topics included in the curriculum were: vehicle dynamics, skids, serpentine, evasive action, controlled braking, specialized backing and pursuit driving. The control group, also composed of police officers, did not receive this training until after the study period. Comparisons were made by reviewing the accident records of both groups of police officers. Accident records for a two-year period preceeding instruction were compared with two years following instruction for both groups. Comparisons were made two years preceeding instruction as compared to the two years following instruction for the experimental group.

The major findings of the study were:

1. The experimental group experienced a 26.8 percent reduction in <u>all</u> accidents following treatment. This change was nearly significant at the .10 level of significance (.125).

2. The experimental group improved its business accident experience by 61.9 percent (24-9). This improvement was significant at the .10 level of significance. A business accident is defined as one occurring during working hours in a police vehicle.

3. The 17-25 year olds within the experimental group improved their total accident experience by 43.5 percent. This change was significant at the .10 level of significance.

4. The 17-25 year olds within the experimental group improved their private accident experience by 60 percent. This was significant at .10 level of significance.

5. The control group experienced a 3.7 percent reduction in accidents. This change was not statistically significant.

6. Although reduction in accidents were noted in each of the other age groups, none was as pronounced as the 17-25 group.

The study indicated that emphasis on instruction and practice in simulated emergency situations, as provided by the program at St. Cloud State University, can make a significant impact on the accident experience of the treated subjects.

1. Further study to determine if the program has accident reduction potential for other populations.

2. Further study to determine the optimum program structure including:
   a. length of program
   b. use of classroom time
   c. use of film simulation

3. Further study to determine the long-term retention of the skill learned.

4. The program should be expanded for <u>all</u> police officers and evaluation methods should be continued.

An ex post facto scientific study was conducted to appraise the impact of the St. Cloud State University's Police Emergency Driving Program. It was found that the program had a beneficial impact on the accident frequency of the treated subjects, and that specific groups within the experimental group experienced statistically significant improvement. The author believes programs of this type deserve serious consideration as an accident counter-measure, and that further scientific investigations be conducted that will improve the impact of this type of advanced driver education.

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Approved by Research Committee:

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TABLE OF CONTENTS

	Page
LIST OF FIGURES	vii
LIST OF TABLES	viii
Chapter	
1. STATEMENT OF THE PROBLEM	1
STATEMENT OF PURPOSE	2
SCOPE AND LIMITATIONS	3
SIGNIFICANCE OF THE STUDY	4
RESEARCH PROCEDURES	5
STATEMENT OF HYPOTHESES	5
2. REVIEW OF RELATED LITERATURE	7
OPPORTUNITY AND POTENTIAL FOR IMPROVEMENT	7
EMERGENCY DRIVER TRAINING PROGRAMS AND RESULTS	11
THE USE OF SIMULATED DRIVING ENVIRONMENTS	13
ACCIDENT RECORDS AS EVALUATION CRITERION	17
SUMMARY	21
3. RESEARCH PROCEDURES	23
SAMPLE SELECTION	23
DESCRIPTION OF TREATMENT	24
FIRST DAY TREATMENT	26
SECOND DAY OF TREATMENT	29
THIRD DAY OF TREATMENT	33

Chapter		Page
	COLLECTION OF DATA	35
	ANALYSIS OF DATA	35
	SUMMARY	43
4.	ANALYSES OF THE DATA	44
	GENERAL FINDINGS	45
	SPECIFIC FINDINGS	49
	SELF REPORTED MILEAGE COMPARISONS	62
5.	SUMMARY, RECOMMENDATIONS, AND CONCLUSIONS	64
	RECOMMENDATIONS	69
	CONCLUSION	70
BIBLIOGRAPHY		72
APPENDIX		77

LIST OF FIGURES

Figure		Page
1.	Off Road Recovery	36
2.	Straight Line Back	37
3.	Turn-Around Exercise and Back-In Exercise	38
4.	S-Curve Backing Exercise	39
5.	Evasive Exercise	40
6.	Serpentine	41
7.	Controlled Brake	42

LIST OF TABLES

Table		Page
1.	Accidents Prior to Treatment	46
2.	Pre/Post Comparison of Experimental Group Accidents	47
3.	Pre/Post Comparisons of Control Group Accidents	48
4.	Business Accident Experiences: 1) Control vs. Experimental Pre	50
5.	Experimental Pre/Post	51
6.	Control Pre/Post	52
7.	Age and Total Accident Comparisons	53
8.	Experimental Accidents by Age Categories, Pre	54
9.	Experimental Accidents by Age Categories, Post	55
10.	26 to 33 Age Group Comparisons, Pre	56
11.	26 to 33 Age Comparisons, Post	57
12.	Control and Experimental Pre/Post Comparison for 26–33 Year Olds	58
13.	17 to 25 Age Group Comparisons for Experimental Group Accidents	59
14.	33 to 41 Age Group Comparisons for Experimental Group Accidents	60
15.	Age Comparisons and Private Accident Experience	61
16.	Experimental 17-25 Year Olds Pre/Post Private Accidents	62

Chapter 1

STATEMENT OF THE PROBLEM

Within the Highway Transportation System police officers are involved in collisions which result in financial and human losses. Advanced driving programs have as a goal the minimization of human and financial losses.

Advanced driving programs assume that emergency situations require immediate, specific responses on the part of the driver. Unless such responses are practiced, at some point in time, they will not be available in the driver's response repertoire. In other words, the untrained driver will respond incorrectly, or more often the case, will not be able to respond at all in an emergency situation. Collisions will result. This premise also applies to police officers.

As a group of drivers, police officers receive little or no special preparation in driving skills. With preparation absent it follows that police officers who are confronted with emergency situations will respond incorrectly, and collisions will be the result.

Support for this analysis is gained from the Minnesota Department of Public Safety's "1976 Accident Facts for Emergency Vehicles." In 1976 there were one hundred and eighteen accidents involving state patrol, sheriff, or local police squad cars. Eighty-five, or seventy-two percent, occurred under emergency circumstances.[1] The police officer's greatest risk of collision occurs during circumstances for which they are not prepared to respond.

John McCleverty, Director of the Cook County Traffic Safety Commission, has added further clarity to this problem in saying:

> Most police departments spend time and money to train an officer to handle a gun, but they accept a man's word, and his drivers license, as evidence that he is "thoroughly" qualified to handle a police vehicle. This, of course, is not a safe and reliable practice. Even persons who are competent drivers under normal circumstances need additional training to properly handle an automobile in emergency situations.[2]

In the 1975 Driver Education Evaluation Program Study, it is reported that scientific evaluations of advanced driving programs are conspicuous by their absence.[3] This lack of research, also, represents a portion of the problem.

STATEMENT OF PURPOSE

The purpose of this study is to appraise the impact on the collision experience of some Minnesota police officers of the Police Emergency Driver Training Program at the Center for Driver Education and Safety at St. Cloud State University. The basic question of the study is: does emphasis on practice and instruction in simulated

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[1] "1976 Emergency Vehicle Accidents" (St. Paul: Minnesota Department of Public Safety, 1977), p. 1. (Mimeographed.)

[2] John J. McCleverty, "Police Driver Training," FBI Law Enforcement Bulletin (May, 1970), p. 17.

[3] U. S. Department of Transportation, The Driver Education Evaluation Program Study (Washington: National Highway Traffic Safety Administration, 1975), p. 48.

emergency situations lead to improvement in the driving performance of the treated subjects? Accident records will be the tools used to make this ex-post facto appraisal.

SCOPE AND LIMITATIONS

The study will be limited to comparisons between and among two groups of Minnesota police officers. The comparisons will be made by reviewing the accident records of both groups of police officers. This comparison will cover a four year period. Two of the years will precede and two years will follow assignment to the control and experimental groups.

Because of the ex-post facto nature of this study, assignment to control and experimental groups was not random. The assignment was arbitrary and based on the dates the subjects reported for training. It is recognized that the lack of random sampling is a limitation of the findings. It is also recognized that the exclusive use of subjects that have reported for training could bias the sample by limiting the types of police officers represented in the control and experimental groups. These two limitations are facts that must be dealt with, since it would be impossible for the study to be conducted without following this procedure. Further explanation of the procedures followed in the selection and assignment of subjects will be found in Chapter 3.

Other factors which must be considered as possible limitations are included in this list:

1) Possible changes in the subject's occupation during the four year period,
2) Possible changes in the subject's duty assignment during the four year period,

3) Possible changes in the subject's police department operational procedures,
4) Possible changes that have occurred in the driving environment.

The findings and conclusions of this study should be interpreted in terms of the previously mentioned limitations. Further discussion of these limitations will be found in Chapter 4.

SIGNIFICANCE OF THE STUDY

Moseley, Chief Investigator, Department of Legal Medicine, Harvard Medical School, has recognized the significance of the concept of advanced driver training by stating:

> Emergency training is a feasible concept. It has been utilized in other areas with considerable effect and with a reduction in the severity of injury and a reduction in the incidence of death under extreme circumstances. In addition, it has provided skills, concepts, attitudes and "presence of mind," so that in situations which were completely unpredicted, the basic characteristics of training came to the aid of the individual in solving the unexpected problem.[4]

This study will serve to support or reject Moseley's analysis of the potential of advanced driving programs.

With the limitations considered previously, this study holds promise for the establishment of base line data for future investigations of the impact of advanced or emergency driving programs. In Chapter 2 the reader will discover that very little large scale evaluation of advanced driving programs has occurred. Therefore, the study has significance for those interested in the establishment and utiliza-

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[4]Chief Investigator Moseley, "Training Drivers to Meet Emergencies" (paper presented at a meeting of the National Safety Council, Chicago, October 18, 1961).

tion of advanced driving programs to reduce the human and financial losses that result from Highway Transportation System collisions.

RESEARCH PROCEDURES

The findings and conclusions reported in this study should be interpreted in terms of the design and previously mentioned limitations. A sample consisting of police officers who have participated in the training program will make up the control and experimental groups. The control group consists of police officers who have been trained from June 1, 1977 until November 30, 1977. The experimental group consists of police officers trained from June 1, 1975 until November 30, 1975. The two groups will be matched and paired by training dates. Subjects trained in June of 1975 are matched with subjects trained in June of 1977. This use of assignment methodology allows for accident record comparisons based on a concurrent four year time period. The control group did not receive training in the four year time period. The necessity for using subjects who reported for training in the control group was the need for subject's permission to use official accident data.

STATEMENT OF HYPOTHESES

A quasi scientific study will be conducted using an ex-post facto design to test the following hypotheses:

<u>General</u>: Emphasis on practice and instruction in simulated emergency situations will lead to improved performance in associated real world situations.

<u>Working</u>: Emphasis on practice and instruction in simulated emergency situations will lead to a significant difference or

improvement in accident experience between the performance of trained and untrained individuals and groups of individuals in real world situations.

Null: There will be no difference between performance of trained individuals and untrained individuals of groups.

The findings based on these hypotheses may only be generalized to this population. To the degree irregularities exist between the control and experimental groups score results may be biased. The author will attempt to reduce this bias to a minimum amount. Multiple comparisons will be made using the variables of age, sex, business accidents, private accidents, unknown accidents, total accidents and annual business and private miles traveled.

Chapter 2

REVIEW OF RELATED LITERATURE

The review of related literature will focus on four critical aspects of this study. First, several studies which deal with the potential of an emergency driving program will be reviewed. Second, studies and publications dealing with similar emergency driving programs will be culled. Third, the appropriateness and potential use of simulated environments in improving related real world performance will be explored. Finally, an analysis of the use of accident records as an evaluation criterion for driving performance will be examined.

OPPORTUNITY AND POTENTIAL FOR IMPROVEMENT

In the 1975 Driver Education Evaluation Program Study, Leon Goldstein pointed out that scientific evaluation of advanced driving programs are "conspicuous by their absence."[1] The author's investigation reaffirms Goldstein's findings. The paucity of studies, let alone scientific studies, is remarkable. For this reason much of what will be reviewed within this section will be articles and brief reports that discuss the importance and potential of advanced driving programs.

In the spring of 1967 at the urging of Ralph Nader, a group

[1] U. S. Department of Transportation, The Driver Education Evaluation Program Study (Washington: National Highway Traffic Safety Administration, 1975), p. 48.

called the Physicians for Automotive Safety conducted a study concerning the causes, hazards, and consequences of police pursuit. Some of the findings were:

1. Seven out of every ten pursuits end in accidents with injury,
2. One out of five pursuits end in death,
3. Five of ten pursuits end in an accident,
4. More than five hundred Americans die each year as the result of high speed pursuit.[2]

In addition to these specific findings, the study recommended ". . . Higher standards for both the selection, status, salary, and training of all police. . . ."[3]

This study is not highly sophisticated, but it served to identify some problems of police emergency driving.

Further identification of the problems of police driving are provided by accident facts from the state of Minnesota. In 1976, 118 accidents involving police vehicles occurred in Minnesota. These 118 crashes resulted in 48 injuries and three fatalities. Eighty-five of these accidents occurred under emergency circumstances, and 27 of the crashes involved pursuit situations.[4] It is apparent that a great potential for savings exists.

Using the 1975 National Highway Traffic Safety Administration study, The Societal Costs of Motor Vehicle Crashes, one finds:

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[2] Physicians for Automotive Safety, National Survey on Incidence and Consequences of Rapid Pursuit by the Police (Springfield: Physicians for Automotive Safety, 1968), p. 6.

[3] Ibid., p. 13.

[4] "1976 Emergency Vehicle Accidents" (St. Paul: Minnesota Department of Public Safety, 1977), p. 1. (Mimeographed.)

1. 67 property damage accidents costing $520 (the average cost of a property damage accident),
2. 48 injury accidents costing $3,185 (the average injury accident costs),
3. 3 fatalities costing $287,175 (the average cost of each fatality),
4. the total cost of three types and numbers of collisions is $1,049,245).[5]

If it was possible to reduce these accidents by 15 percent, the potential annual savings would be $157,386.75.

James C. Fell has helped clarify some of the elements that contribute to this potential for improving drivers' abilities in coping with emergency situations. Dr. Fell described the criticalness of the driver in the Highway Transportation System by saying "(the driver) . . . is the most active and vital element in the driving situation . . . If he receives no information, ignores the information, makes an incorrect decision based upon the information, or acts incorrectly, a collision becomes eminent."[6] With Dr. Fell's description in mind, it is little wonder that 85 percent of the causitive factors of automobile accidents are reported as human error.[7] In this same article Dr. Fell recognized the importance of experience and placed emphasis on the potential for improved driver performance through education and training.[8]

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[5] U. S. Department of Transportation National Highway Traffic Safety Administration, 1975 Societal Costs of Motor Vehicle Accidents (Springfield: National Technical Information Service, 1976), p. 2.

[6] James C. Fell, "A Motor Vehicle Accident Causal System: The Human Element," Human Factors, XVIII (February, 1976), p. 87.

[7] National Safety Council, Accident Facts, 1976 Edition (Chicago: National Safety Council, 1976), p. 48.

[8] Fell, p. 89.

Others have examined the human element in traffic accidents. Richard Hatterick and James Barthurst, working for URS Systems Corporation under a Department of Transportation research grant, have investigated accident avoidance skill training and performance testing. The Department of Transportation grant reflects the National Highway Traffic Safety Administration's concern that present driver training programs have not shown effectiveness in reducing the large number of "critical conflict collisions."

> Critical conflict is defined as one where (a) there is a conflict between two road users that will result in a collision unless at least one of the two parties responds correctly and (b) there is a possibility that a collision can be avoided or ameliorated if one party makes a correct response, and (c) there is a compressed time interval which precludes recourse to normal driving skill.[9]

The purpose of the URS study was to determine whether drivers could be trained to avoid critical conflict accidents. Barthurst and Hatterick report that based on an analysis of 372 case histories of accidents occurring in Monroe County, Indiana in 1970 to 1974:

1. Sixty-nine percent of the accidents involved critical conflict situations;
2. Four hundred eighty-eight drivers who experienced critical conflict situations were able to see the situation in time to avoid the conflict;
3. It is possible to avoid 54 percent of these collisions;
4. In all critical conflict cases drivers needed to take action to avoid the collision;
5. Locked wheels occurred in 45 percent of the collisions.[10]

Based on these and other findings, it appears the potential for improvement exists.

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[9]Richard Hatterick and James Barthurst, Accident Avoidance Skill Training and Performance Testing. Final Report, U. S. Educational Resources Information Center, ERIC Document ED 140 021, March, 1976, 1.

[10]Ibid., p. 123.

One recommendation of the Hatterick and Barthurst study has profound implications for the author's current study. "It is recommended that a large number of students be trained and that training be evaluated in an operational, real world setting."[11]

In conclusion, three important points need emphasis. First, it appears that police pursuit and emergency driving involve high risk. Second, the human element (the driver) is very susceptible to error because of the complexity of the driving task. Third, accident data seems to indicate there is hope for improvement of driving performance in "critical conflict" situations. When these three elements are considered, it is apparent why many traffic safety educators and police officials have begun the development of police emergency driver training programs.

EMERGENCY DRIVER TRAINING PROGRAMS AND RESULTS

Many concerned traffic safety educators and police officials are interested in police emergency driver training programs. The author will attempt to list a number of these programs and to assess the level and type of evaluation that has been conducted.

There are two emergency driving programs for which evaluative data are reported. These are the General Motors Program and the Maryland Program. Both studies used relatively small samples, and neither used a pre-post design. Sample selection in both studies was nonscientific in design. Control and experimental groups were compared in both studies.

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[11] Ibid., p. 124.

The General Motors Study was concerned with a 17 month period of time,[12] and the Maryland study for an 18 month time period.[13] The results of these studies are summarized in the following chart:

	Control	Experimental	Percent Reduction in Accident Costs
General Motors	30	30	50% [14]
Maryland	33	30	48% [15]

Official accident records were used in comparing the driving performance of the control and experimental groups for both studies. The training of each of the two experimental groups received was similar. The curriculum used was structured around a two-day schedule. Controlled braking, evasive, serpentine, and off-road recovery exercises were utilized.[16] The physical layout of these exercises approximates those used in the present study.

Emergency driving programs have been or now are being conducted or developed by the following agencies: Indiana State University, Central Missouri State University, Kansas State Department of Education, National Safety Council, Appalachian State University, Illinois State

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[12] The Driver Education Evaluation Program Study, p. 48.

[13] Roger P. Quane, "Emergency Driving Skills Feasibility Study" (Report to State of Maryland, Department of Public Safety, Pikesville, June, 1973), 1-2.

[14] The Driver Education Evaluation Program Study, p. 48.

[15] Quane.

[16] Ibid.

Police, Southern Illinois University,[17] National Police Driving School,[18] Suffolk County Police Department,[19] The Commenwealth of Virginia,[20] Liberty Mutual Insurance Company,[21] and EMRAD of Minnesota.[22] This list is not meant to be comprehensive, and the author recognizes that other agencies have conducted and/or are conducting programs. The intent was to demonstrate the large number of interested persons and agencies. It appears that none of the listed agencies has published evaluative findings of its studies.

THE USE OF SIMULATED DRIVING ENVIRONMENTS

The purpose of this section is to provide the reader with a brief theoretical review of the principles and potential of simulated driving experiences. Much has been written concerning driving simulators, but most of the discussion centers on the use of films in combination with a fixed based simulator. It should be remembered that the type of simulation technique used in this study is dynamic in design.

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[17] Statement by Richard A. Whitworth, Manager, Traffic Safety Department, General Motors Corporation. Personal interview. Milwaukee, Wisconsin, August 17, 1977.

[18] McCleverty, p. 17.

[19] Harry N. Babb, "Emergency Vehicle Operations Clinic," Police Chief, XXXIX (August, 1972), 33.

[20] Michael R. McDonald, Virginia Emergency Vehicles Operations Curriculum, U. S. Education Resources Information Center, ERIC Document ED 132 394, May 1977.

[21] Liberty Mutual Insurance Company, How to Set Up an Emergency Driving Range, Liberty Mutual Insurance Company.

[22] Robert E. Sheldon, "Steer Clear of Trouble," Minnesota Motorist (February, 1978), 17.

The author believes that the basic principles of simulation apply to both fixed base and dynamic simulation.

The corner stones of all driving simulation are summarized in a publication authored by Dr. James Fox. In this publication Fox reviewed the principles of transfer of training and the U. S. Military studies concerning simulation. Fox concluded the section dealing with transfer of training with this summary:

> . . . the device (simulator) should confront the student with situations which to him are similar to those the actual task requires and should require him to make responses which are appropriate to the task. The greatest positive transfer occurs when there is little variation in the responses required.[23]

This quotation should be useful in evaluating the methodologies described in Chapter 3 of this paper.

Fox went on to summarize five major findings of U. S. Military Research on Simulation. The findings can best be reviewed by using Fox's own summarizing statements. The five findings are:

1. There is differential transfer among the total task. It is probable that some parts will exhibit a great degree of positive transfer; others no transfer at all; and still others negative transfer. In the construction and use of a training device it is important to determine which parts fall in the various categories.

2. Procedural responses are more likely to transfer than are adjustive responses. Based on the available evidence, it is reasonable to assume that the procedural responses will fall in the positive transfer category. It also appears that adjustive responses tend not to transfer without special modification of the device or specially developed syllabuses.

3. The synthetic training device does not have to be a precise and faithful reproduction of the actual task for positive transfer to occur. Quite different types of devices, each designed to simulate the same task, may be equally effective.

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[23]James H. Fox, Driver Education and Driving Simulators, U. S. Educational Resources Information Center, ERIC Document ED 037 019, July, 1970, 5.

4. A synthetic training device does not have to reproduce kinesthetic feedback faithfully to be effective.

5. Realism does not necessarily increase the validity of a device.[24]

This list should be used in assessing the appropriateness of the simulation techniques used in this study and described later in Chapter 3.

Three recent reports give support to the simulation technique in critical driving skill acquisition. Heismstra and Lucas report ". . . the ability to train drivers on intact performance of a complex task is an achievable goal."[25] A film fixed base simulation technique was used and skills essential to passing were taught to a group of drivers. In the off road setting the accuracy of passing choice improved.[26] Included in their report Heismstra and Lucas say ". . . it seems quite obvious that this film simulation technique is not limited to simple passing situations. It seems that such a technique could be employed for any driving skill which is filmable, and emergency stop or steer situations, and skid control are eminently feasible and practical."[27]

Snapper and Seaver report that both track (dynamic simulation) and fixed base simulation results indicate that subjects quickly improve their ability to perform extreme vehicle maneuvers. They also state that

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[24]Ibid., pp. 14-15.

[25]Norman W. Heismstra and Richard L. Lucas, An Evaluation of the Training of a Critical Driving Skill by Means of a Simulation Technique, Final Report, U. S. Education Resources Information Center, ERIC Document ED 043 767, June, 1970, 25.

[26]Ibid, p. 26.

[27]Ibid., p. 27.

training is an important element in improving driver performance in extreme maneuvers since the familiar family car handles much differently under extreme stres situations. Finally, Snapper and Seaver state that one advantage of vehicle dynamics simulation over conventional fixed based simulation is the ability to train subjects to deal with the unfamiliar forces created by emergency situations.[28]

John Prentice has speculated on the possible use of game theory for determining proper atrategies for evasive actions.[29] Prentice concluded the article with several recommendations. One recommendation, which has particular bearing on this study, suggests the use of a man machine simulator or field experiment to test driver's capabilities for achieving optimal strategies for evasive actions.[30] This recommendation is an indicator of the promise of simulated teaching of evasive actions decision making.

In this section the potential and appropriateness of simulation for teaching driving skills have been examined. Several important points need emphasis. First, Fox has shown that simulation has been used successfully to teach skills too difficult or expensive to be taught in their real world setting.[31] Second, U. S. Military Studies have shown that when proper procedures and techniques are utilized, simulation can

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[28]Kurt J. Snapper and David A. Seaver, "Behavioral Applications of Vehicle-Dynamics Simulation," Behavior Research Methods and Instrumentation, V (1973), 115.

[29]John W. Prentice, "The Evasive Action Decision in an Intersection Accident: A Game Theory Approach," Journal of Safety Research, VI (December, 1974), 147.

[30]Ibid., p. 148.

[31]Fox, p. 5.

be effective.[32] Finally, the potential for simulations use in training drivers for emergency maneuvers has been recognized by Snapper and Seaver, Prentice, Heismstra and Lucas. It is hoped that this particular section will assist the reader in evaluating the simulation methods used in the training program which this study evaluates.

ACCIDENT RECORDS AS EVALUATION CRITERION

This final section of the chapter will deal with the most important consideration in any evaluative study, the evaluation criterion used in determining success or failure of the treatment provided. The purpose of this section is to explore the limitations, cautions, and problems associated with accident data.

Harry Harmon has identified several important considerations concerning the use of accident records. First, presently available accident information is inadequate.[33] Second, if accident data is properly assembled this information can be both valuable and necessary for the evaluation of driver education programs.[34] Third, real world driving performance must be measured directly. Fourth, decisions regarding the optimum strategy for assessing real world driving performance is controlled by the present state of the art of measurement criterion. The report concludes by saying, "Long term studies, while difficult,

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[32] Ibid., pp. 14-15.

[33] Harry Harmon and Others, Evaluation of Driver Education and Training Programs, U. S. Educational Resources Center, ERIC Document ED 041 104, March, 1969, 1.

[34] Ibid., p. 100.

expensive, the time consuming, are probably the best means of conducting scientific evaluations and research in driver education."[35]

The concerns identified by Harmon are further supported by Forbes, Nolan, Schmidt, and Vanosdall. The concluding sentences of their opening paragraph summarized their position ". . . accident records for highway safety research are of most practical use for comparisons of large groups of drivers over relatively long periods of time. They serve to show statewide safety increases and decrease . . ."[36]

In adding further clarity to the role of accident records in evaluation studies, McGuire has reported that it is common practice to use motor vehicle accident records as sources of data for accident research.[37] McGuire's statement is supported by numerous research studies that have used accident records as the evaluative criteria (Jean Shaoul,[38] Forrest M. Council,[39] J. Richard Stewart,[40] Lynn

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[35]Ibid., p. 68.

[36]T. W. Forbes and Others, "Driver Performance Measurement Based on Dynamic Driver Behavior Patterns in Rural, Urban, Suburban and Freeway Traffic," Accident Analysis and Prevention, VII (December, 1975), 257.

[37]Frank L. McGuire, "The Nature of Bias in Official Accident and Violation Records," Journal of Applied Psychology, LVII (1973), 305.

[38]Jean Shaoul, The Use of Accidents and Traffic Offenses as Criteria for Evaluating Courses in Driver Education, U. S. Education Resources Center, ERIC Document ED 122 055, September, 1976.

[39]Forrest M. Council and Others, An Evaluation of North Carolina's Multiple Vehicle Range Program in Driver Education: A Comparison of Driving Histories of Range and Non-range Students, U. S. Educational Resource Center, ERIC Document ED 126 232, August, 1975.

[40]J. Richard Stewart and B. J. Campbell, The Statistical Association Between Past and Future Accidents and Violation (Chapel Hill: Highway Safety Research Center University of North Carolina, December, 1976).

Larson,[41] John Whittenburg,[42] Thomas Andersen,[43] D. H. Schuster,[44] Maximilian Iacano,[45] and an unauthored study by the National Highway Traffic Safety Administration[46]). McGuire goes on to say that it is generally known that these accidents are under reported when official driving records are used as the source of information.[47] McGuire stated

> It seems appropriate to conclude that most states have difficulty in maintaining complete records, which make interstate comparisons difficult, and caution should be used when these records are used because of the probable biases by sex, age, and occupation.[48]

Richard Zylman helped to clarify the limitations of accident records when he said,

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[41] Lynn Larson and J. Paul Gill, "A Report on the Use of Tachographs in Marked Police Vehicles" (paper presented at the National Safety Congress, Chicago, October, 1977).

[42] John A. Whittenburg and Others, Driver Improvement Training and Evaluation, U. S. Educational Resource Center, ERIC Document ED 111 926, July, 1974.

[43] Thomas F. Andersen, "A Follow-up Study of Alumni Trained in a Special Education Driver Training Program for the Educable Mentally Retarded," Dissertation Abstracts International, 36 (1976), 7333. (University of Southern California.)

[44] D. H. Schuster, "The Effectiveness of Official Action Taken Against Problem Drivers: A Five Year Follow-Up," Journal of Safety Research, 6 (December, 1974).

[45] Maximilan W. Iacano, "A Driver Improvement Program," Dissertation Abstracts International, 33 (1973) 4560. (University of Michigan.)

[46] National Highway Traffic Safety Administration, A National Estimate of Performance: Statewide Highway Safety Program Assessment, U. S. Educational Resource Center, ERIC Document 114 591, July, 1975.

[47] McGuire, p. 305.

[48] Ibid.

> It would seem that everyone knows what a traffic accident is. However, the questions as to whether such an event should be reported to a police department is dependent on whether a policeman will appear at the scene to write a report, whether a police agency will report it to the Department of Motor Vehicles. These questions have almost as many answers as there are police agencies.[49]

Zylman is less pessimistic and more hopeful for the future use of accident records and research, but he cautions further that "data gathered by any agency can only be used to describe conditions in that jurisdiction."[50]

Ian Smith further develops Zylman's recommendations. Smith recommends a combination of self reports and official records, but more importantly he recommends careful definitions of the purpose of the use of the accident data when deciding on the methods used in the retrieval of this information.[51]

Smith's concept of self reporting has been disputed by Sanford Weinstein. Weinstein has concluded, "self reports are generally regarded as unreliable sources of accident data."[52]

Based on the author's evaluation of the recommendations and cautions outlined by McGuire, Zylman, Smith, Weinstein, Harmon, and

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[49]Richard Zylman, "Driver Records: Are They a Valid Measure of Driving Behavior?" Accident Analysis and Prevention, IV (February, 1972), 334.

[50]Ibid., p. 348.

[51]D. Ian Smith, "Official Driving Records and Self Reports as Sources of Accident and Conviction Data for Research Purposes," Accident Analysis and Prevention, VIII (September, 1976), 210.

[52]Sanford Weinstein, "Self Reported Accidents: An Examination of Data Gathering Techniques," Journal of Safety Research, VI (March, 1974), 46.

Forbes et al., the following list is offered:

1. A properly assembled accident information system is necessary for evaluation purposes.
2. Real world driving must be measured directly, and when necessary use of accident records is essential to the study, the best available technology should be used.
3. Long term comparative studies within the same legal jurisdiction are most appropriate.
4. Large groups of subjects should be used for comparison purposes.
5. Accident records can be both incomplete and biased, and research design should accommodate these limitations.
6. Self reporting is not a panacea for the short comings of official driving records.

Bruce Greenshields may have summarized the problems of accident data when he said,

> The difficulty with the rare event (accidents) is not in understanding what it is but in deciding what to do about it. Its rarity makes statistical analysis difficult. This analysis requires the sample be of sufficient size, to furnish a time profile of the entire population. With the rare event this may take so long that obtaining a meaningful sample is impractical or impossible.[53]

It is the hope of the author that he has adequately designed the research methodology to accommodate all of these difficulties.

SUMMARY

This review of the literature has focused on four critical aspects of this study and potential for improvement of police emergency driving has been identified. While it was noted that a pausity of similar studies exist, there is considerable interest in the traffic safety community in emergency driving programs for police officers. The

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[53]Bruce B. Greenshields, "Traffic Accidents—The Uncommon Common Events Problem," <u>Traffic Quarterly</u>, XXVII (April, 1973), 212.

appropriateness and guidelines for the use of simulation in an emergency driving program were explored. Finally, cautions and limitations of accident records as evaluative criterion were identified.

Chapter 3

RESEARCH PROCEDURES

The ex-post facto design of this quasi scientific appraisal is the result of the author's late entry to this ongoing program of police driver training at St. Cloud State University. In the fall of 1976 the author began work for the Center for Driver Education and Safety at St. Cloud State University. One of his new assignments was the evaluation of the Police Emergency Driving Program.

By the fall of 1976 two important developments had occurred. First, a deadline for the completion of the study had been set, and second, training and data collection had already begun. With the deadline of October 1, 1978 established and with the longitudinal nature of the study considered, it would have been impossible to begin the study anew. Under the advice of the field study coordinator and after thorough consideration, the study was undertaken in spite of the known limitations.

SAMPLE SELECTION

In testing the hypotheses of the study[1] a sample consisting of approximately 450 Minnesota Police officers were selected. This selection was made on the basis of dates these officers reported for training

[1]Chapter 1, pp. 5-6.

in the Emergency Driving Program. This sample was divided into two groups. The division was accomplished by assigning police officers who reported for training between June 1, 1975, and November 30, 1975 to the experimental group. The control group consisted of police officers who reported for training between June 1, 1977, and November 30, 1977. The use of these assignment dates allowed for a sufficient period of time to pass for driving record comparisons.

To allow for driving record comparisons, based on a concurrent four year time period, the control group subjects were assigned training dates from June 1, 1975, until November 30, 1975. It appears that members of the control group reported for training during the June 1975 until November 1975 time period. This assignment allows for the concurrency of the control and experimental pre and post two year time intervals.

The assignment of 1975 training dates to control group subjects was accomplished by changing the 1977 date of training to a 1975 date of training. For example:

> A subject whose 1977 date was September 3, 1977 was assigned a 1975 date of training of September 3, 1975.

It should be remembered that the training date for control group subjects is only arbitrary assignment that represents an effort to establish a control group with 1975 dates of assignment that allow for comparison of similar time periods.

DESCRIPTION OF TREATMENT

The experimental group, unlike the control group, completed a three day program of classroom and behind the wheel instruction at the

Center for Driver Education and Safety at St. Cloud State University at the mid point of the four year time period used for comparison purposes. The three day program followed this general outline:

I. First Day

  A. Classroom 0800-1200

    1. Registration
    2. Introduction

      a. Operational and Safety Procedures
      b. Course Design

    3. Explanation of Maneuvers

      a. Evasive - Collision Avoidance
      b. Serpentine - Vehicle Placement
      c. Off Road Recovery - Vehicle Control
      d. Controlled Braking - Vehicle Control

    4. Vehicle Dynamics

      a. Oversteer
      b. Understeer
      c. Weight Transfer
      d. Coefficient of friction

  B. Lunch 1200-1300

  C. In Car Instruction 1300-1630

    1. Vehicle Orientation
    2. Vehicle Exercises

      a. Evasive
      b. Serpentine
      c. Off Road Recovery
      d. Controlled Braking

II. Second Day

  A. Classroom 0800-1000

    1. Wet Weather Driving
    2. Skid Control
    3. Backing Exercises

  B. In Car Instruction 1000-1200

    1. Skid Control
    2. Vehicle Exercises
    3. Backing Exercises

  C. Lunch 1200-1300

  D. In Car Instruction 1300-1615

  E. Classroom Discussion

III. Third Day

A. Classroom Explanation of Perimeter Exercises 0800–0830

B. In Car Instruction 0830–1200

1. Introduction to Perimeter Exercises
2. Practice

C. Lunch 1200–1300

D. In Car Instruction 1300–1615

1. Perimeter Exercises
2. Simulated Pursuit

E. Summation and Closing Remarks 1615–1630

FIRST DAY TREATMENT

On the first day the subjects received classroom instruction that prepared them for the actual driving experiences to follow. Immediately following work in the classroom the subjects receive in-car instruction on the following exercises:

1. Serpentine
2. Off Road Recovery
3. Evasive Actions
4. Controlled Braking

Instruction and practice of these four skill areas was accomplished by grouping three officers to one vehicle. The instructor would then work with one subject while the others observed or set cones that were hit by the driver. This type of in vehicle instruction lasted three and a half hours. This means each subject received an hour and twenty minutes of driving time on the first day of the program.

The hour and twenty minutes of driving time was divided into four equal time blocks for each of the exercises. The serpentine, or first skill taught, was designed as a skill builder for steering, acceleration, and vehicle placement control factors. This exercise helped the subjects become comfortable with "9-3" steering position, and developed skills essential to success in the three remaining exercises. The object of a successful serpentine is to hold the vehicle speed constant and maintain a smooth rhythmic steering action throughout the exercises.

The area used for the serpentine was five hundred feet long and twenty four feet wide. Seven cones, set at fifty foot intervals, created the serpentine exercises. The remaining distance was used for an approach and out run areas.[2]

The purpose of the off road recovery was to insure the subjects were able to maintain control of the vehicle when forced to leave and re-enter the paved roadway surface. Successful off road recovery was executed without crossing into the oncoming lane of traffic or without being hung up on the edge of the paved roadway.

In simulating an off road recovery, a five inch concrete curb was used to represent the edge of the pavement. The shoulder was simulated by a paved area fourteen feet wide. The total length of this exercise was 200 feet. The approach ramp for this exercise was 400 feet long, and the exit area was the evasive area. The width of the approach ramp is twenty-four feet wide. All that is needed to accomplish the off road recovery is the command to leave and re-enter the roadway.[3]

Evasive actions may be necessary for driving survival at any moment. The driver may have to evade a stalled car, pedestrian, or

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[2]See Figure 6, p. 41.

[3]See Figure 1, p. 36

accident immediately ahead. The successful evasive maneuver involved proper steering input and speed control in timed sequence.

Evasive actions were simulated by the use of pneumatic cord controlled switching devices. This device activated a three light system. The lights served as a means of communicating to the driver which lane was clear.

The approach ramp for the evasive exercises was the same as the off road recovery approach ramp. The trip cord was located at the end of the approach ramp and was seventy five feet from the barrier cones. When the driver was informed of the correct lane choice fifty feet remained before the vehicle would strike the barrier cones. Three twelve foot lanes were the first portion of this exercise. The center lane was the entrance lane, and the left and right lanes were the areas used in evading. The distance from the first barrier cone to the second barrier was eighty feet. When the driver reached the second barrier, a lane change was required. Once this lane change had occurred all that remained of the evasive exercise was a gradual left hand curve that lasted seventy five feet.[4]

A common reaction to hazardous situation is to brake. The controlled braking exercise was designed to provide the student with instruction on the use of the brake and steering systems in a hazardous situation. Successful controlled braking resulted in a quick stop with little or no wheel lock up.

The controlled braking area had a separate approach ramp that

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[4]See Figure 5, p. 40.

parallels the off road recovery and evasive areas. A simular trip cord arrangement was used to trigger the light system for this exercise. The differences between this area and the evasive were: (1) only two lights are used, (2) the left hand twelve foot lane curves out to the left rather than paralleling the other lanes, and (3) the second barrier requires a twenty four foot lane change.[5]

Instruction in all four of the first day exercises was similar. A demonstration at both low and higher speeds always preceeded the subject's driving. When the subjects begin to drive, speeds were kept down, and emphasis was on proper technique and procedures executed by the subjects. It was common that speeds would increase as skills improved but it should be remembered that technique was more important than speed.

SECOND DAY OF TREATMENT

A classroom presentation began the second day. The purpose of this presentation was to prepare the subjects for the skid pad and backing exercises.

Backing is a high risk procedure because of limited visibility and limited experience. All of the backing exercises were designed to provide assistance in gaining better visibility and understanding the importance of proper premaneuver procedures.

The back-in procedure placed emphasis on critical reference points and mirror usage to gain precision in backing and turning. The area used for this exercise was eight feet wide and eighteen feet deep.

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[5]See Figure 7, p. 42.

The approach area was eighteen feet wide and one hundred and twenty five feet long. The driver was told to pull up parallel and close to the cones marking the opening to the eight foot lane. When the left front fender of the vehicle was in line with the far edge of the eight foot lane the wheels were turned full right. Using the left outside mirror the driver must watch for the point at which the left rear corner of the vehicle was two feet from the end of the eight foot lane. When this point was reached the driver shifts to reverse and turns full left. Backing slowly the driver watched for clearance on the left side of the vehicle by looking into the left outside rearview mirror. It was extremely important for the driver to keep the vehicle close on the left side since this was where distance could best be judged. Once the vehicle was in line with the eight foot lane, the wheels were straightened and the exercise was completed. The subjects were asked to repeat this exercise until they were successful three out of four times.[6]

The turnabout provided similar experiences and reversed the car's movements. To allow for this reversal of vehicle actions, the lane used for turning about was twelve feet wide. All other dimensions remained the same as in the back-in exercise. In completing the turnabout, the driver was told to keep the vehicle as far to the left of the lane as possible. When approaching the twelve foot lane, the driver keeps as far to the left as possible when entering the twelve foot lane. Using the rear view mirror, the driver must judge when the end of the twelve foot lane was two feet from the end of the vehicle. Once this point was reached, the vehicle was placed in reverse and the wheels were turned

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[6]See Figure 3, p. 38.

full left when backing. When the vehicle cleared the lane the driver shifted to drive and proceeded.[7]

In straight line backing an adequate reference point and driver position are essential to success. If the driver looked too far to the left or too close to the rear of the vehicle, failure was inevitable. A twelve foot lane five hundred feet long was used for straight line backing. Drivers were told to place the vehicle in reverse and to put the left hand at the twelve o'clock position on the steering wheel. It was very important to turn the upper body and to aim high in steering in this exercise.[8]

To practice making small turns while backing, an "S" curve that swings eighteen feet from left to right was used. The "S" curve was three hundred feet long. Three reference points were used for negotiating the curve. First point was the center of the lane going into the curve. When the vehicle reached the corner, the second reference point was used. In order to bring the second reference point into view a small left steering input was needed. The new center of the lane becomes the reference point. Once the vehicle had reached the second corner a small right steering input was given, and the third and final reference point was used.[9]

The skid pad was an ideal area to review the basics of vehicle control on a slippery surface. Skids were induced by locking the rear

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[7]See Figure 3, p. 38.

[8]See Figure 2, p. 37.

[9]See Figure 4, p. 39.

wheels or by over acceleration. Control was regained by steering and removal of the causitive agent. Skids were controlled at three points. The first control point was at the time the skid begins. If control cannot be regained at this point, the next control point was at the one hundred and eighty degree position. The final control point was at the three hundred and sixty degree position. All efforts to control skids involved vehicle and human interaction; therefore, successful completion of the skid experience meant the subject had discovered human and vehicle limitations in a variety of skidding situations. Points receiving emphasis during the instructional time period on the skid pad were:

1. Early sensing of the skid,
2. Quick reaction by steering,
3. Sensing when the skid is ending,
4. Removal of the causitive agent,
5. Locked wheels cannot corner or respond.

Each subject received twenty minutes of instruction on the skid pad, and an additional forty minutes of observation of others reacting to skids.

The second day of this program involved a great deal of rotation from one instructional area to another. The fourth and final instructional area provided a staging area for the other three areas. This final instructional area consisted of the serpentine, off road recovery, evasive, and controlled braking exercises. When utilizing these areas, an AM radio communications system was used. This allowed one instructor to manage the learning environment for numerous vehicles. The exact number of vehicles and subjects being managed by the radio control system varied all day long.

Every effort was made to maximize the driving time of each student. The average length of driving time using this system was two and a half hours. These two and a half hours were divided between a review of the basic exercises and instruction in new activities. The new activities were modifications of the basic exercises. A list of these modifications follows:

1. Evasive exercise as a controlled brake exercise,
2. Controlled brake exercise as an evasive,
3. Double lane change evasive.

All of these advanced exercises were designed to increase the subject's skills in braking, steering, and positioning the vehicle.

The final activity of the second day was a short classroom discussion of the day's problems.

THIRD DAY OF TREATMENT

The third day began with a classroom discussion of pursuit driving tactics. Following this discussion the perimeter road activities were discussed. The perimeter road consisted of a 1.3 mile loop that contained a variety of obstacles and cornering exercises. The emphasis was on control techniques and not speed. As with all of the other in-vehicle portions of this program, a demonstration of the proper procedures and techniques used on the perimeter road preceeded the subject's actual driving. When the subject began the perimeter road driving, an instructor driven lead vehicle was used to set the pace and provide an example for the subjects to follow. The AM radio communications system was used to correct errors and provide additional instruction regarding proper technique. As a means of evaluation and reinforcement, a third instructor moved from vehicle to vehicle to evaluate and assist each driver.

During this introductory phase of perimeter road instruction emphasis is placed on the following procedures:

1. "9-3" steering as a good starting position,
2. Turning hand over hand when the "9-3" steering doesn't provide enough input,
3. Braking prior to the exercise not during the exercise,
4. Less brake pressure on the brake when steering inputs are great,
5. Accelerating only as the vehicle is leaving the corner or the exercise,
6. Setting vehicle up to provide maximum space for corners and exercises,
7. Smooth rhythmic steering, braking, and acceleration.

Once the introductory phase was completed, the subjects were given two hours to practice and perfect the techniques taught. Instructor feedback during this phase is provided by the AM radio communication and in-vehicle observation. When the practice session had been concluded, orientation to the program's final activity was conducted.

This orientation dealt with the management of the simulated pursuit situations. The purpose of this activity was to give the subjects a chance to put all of their driving skills to one final test. Subjects were paired and assigned to vehicles. One vehicle was designated the pursued and the other the pursuer. The instructions were:

1. Pursuit will begin with an oral command,
2. Pursuit will end when a cone is hit or five minutes of time have elapsed,
3. The pursued vehicle can use any of the paved area on the facility,
4. The pursuer must follow the same route as the pursued,
5. Red lights and siren will be used,
6. The pursuer may not close in more than a two second following interval.

When the five minute time interval was up or a cone had been hit, the roles were switched. This activity was continued until all of the subjects had the opportunity to play both roles. Control and feedback during this phase were provided for by radio communications.

The program ended with a brief completion ceremony.

COLLECTION OF DATA

With the assignment and training completed, the accident records for both groups of drivers were collected. Driving records for a four year period were examined. Two of the years preceeded the training or assigned dates and two years followed these dates. In addition to this accident data, information concerning annual miles traveled was collected.

The source of the accident records was the subject's official Minnesota driving records. Source for the annual miles traveled was a questionnaire completed at the time of training or assignment.

ANALYSIS OF DATA

Once the data were collected the computations and comparisons were undertaken. To facilitate the comparison process the four year time interval was divided into two two-year time intervals. The four years were divided by the final date of training or assignment. This meant the two years pre and post for each group were related to training or assignment dates and not the Julian calendar.

When the two years pre and post had been established, accidents were counted, and comparisons between various predictor variables were made. A Chi Square statistical test was used to determine significant

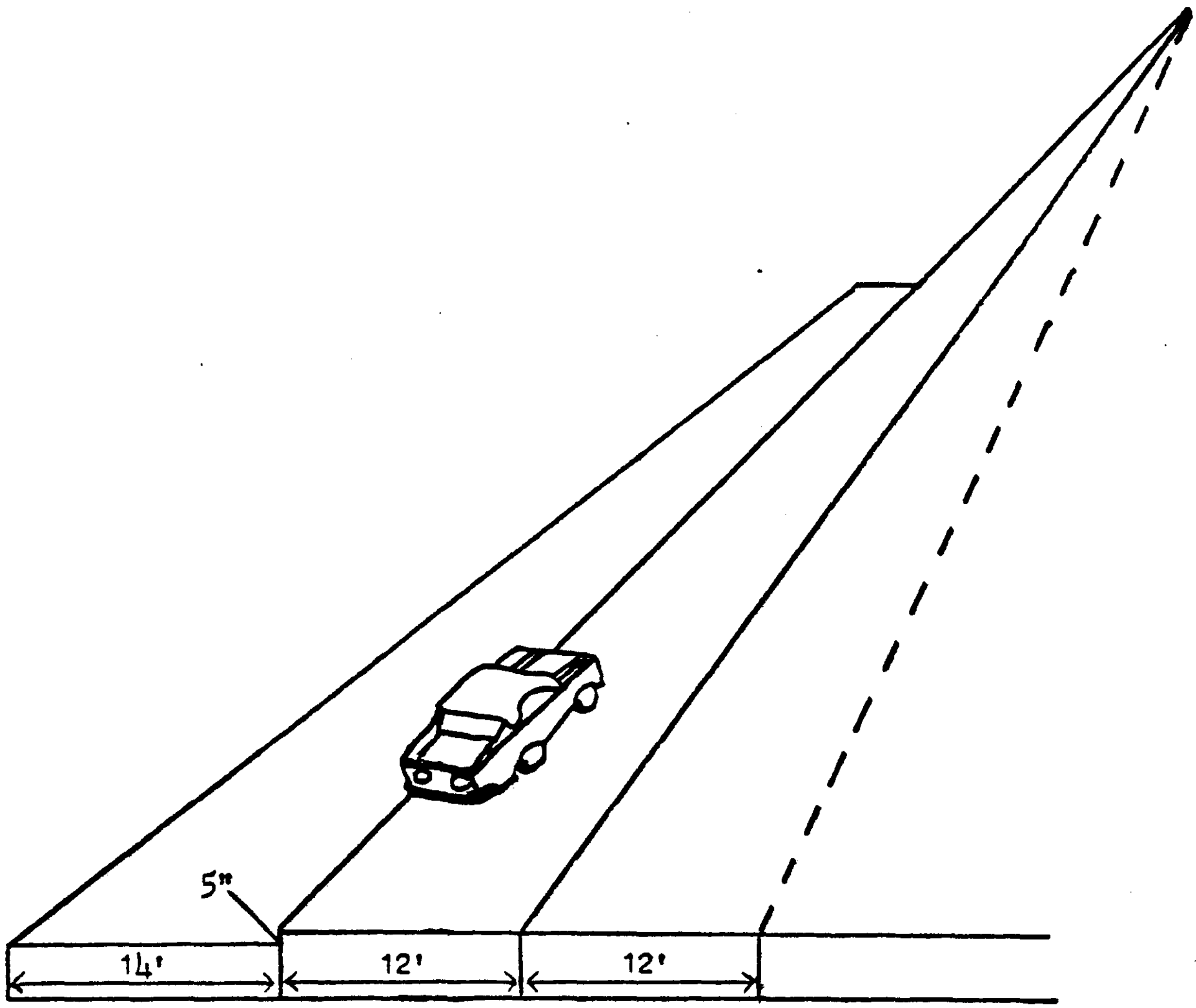

Figure 1

Off Road Recovery

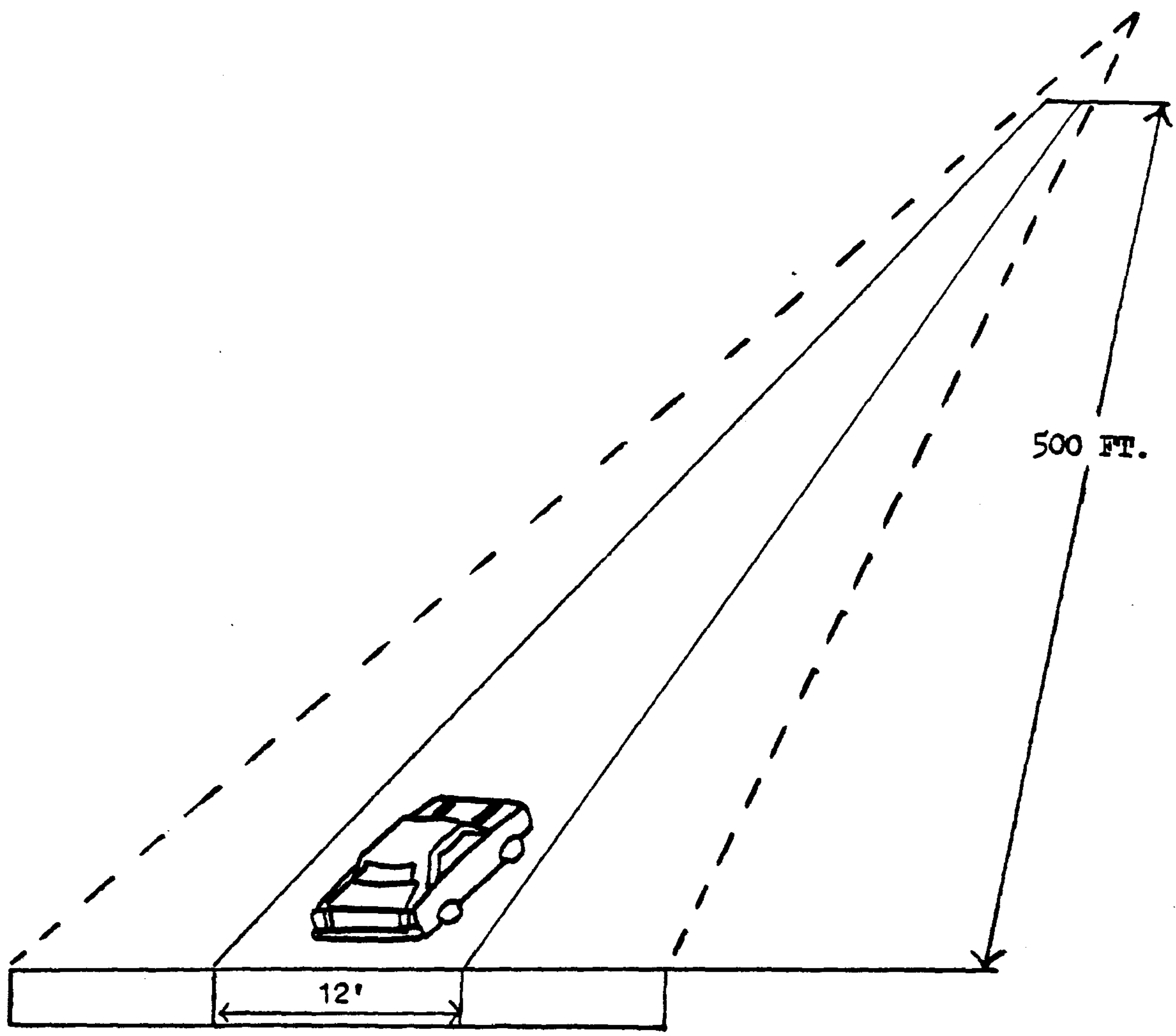

Figure 2

Straight Line Back

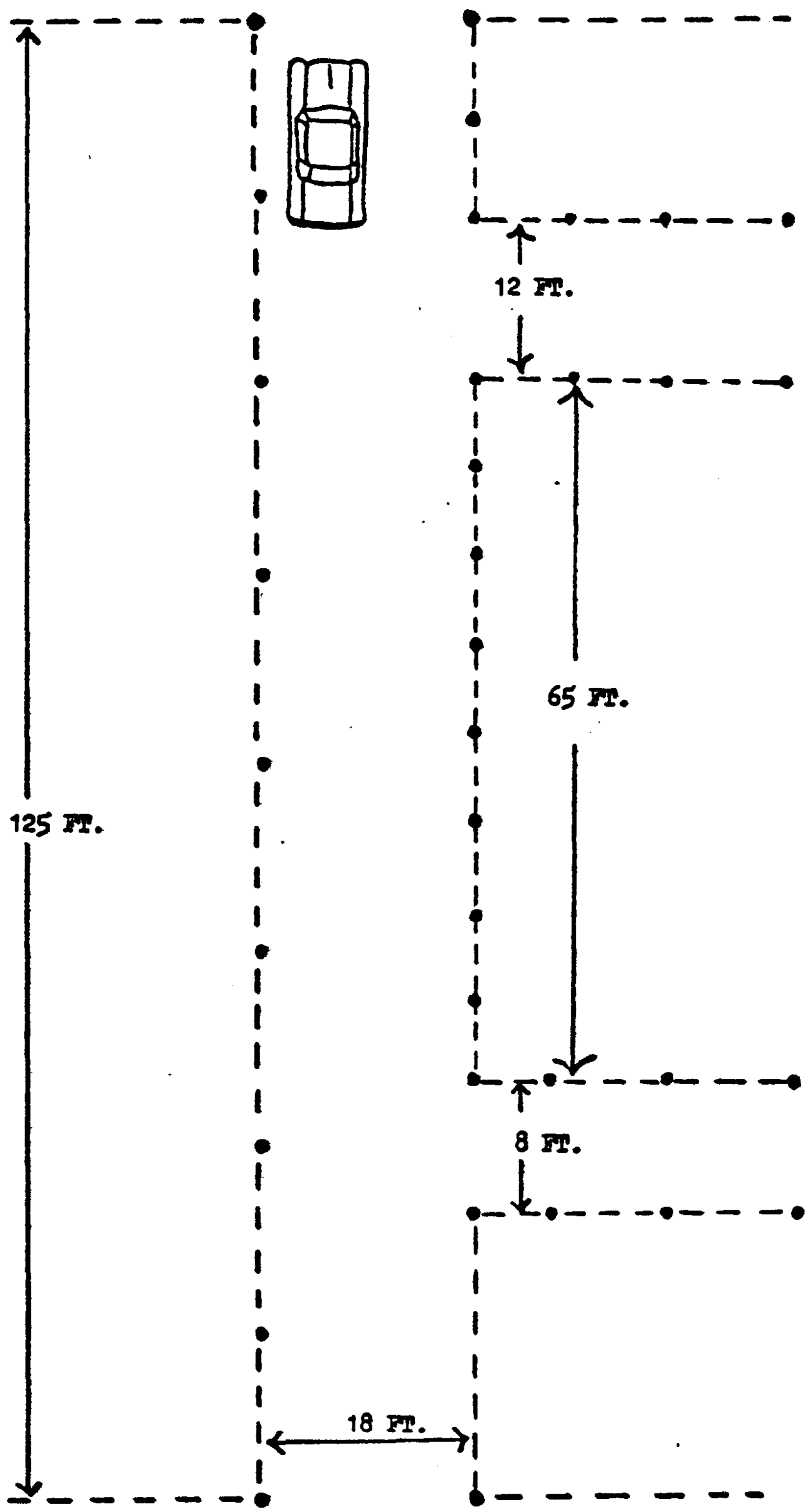

Figure 3

Turn-Around Exercise and Back-In Exercise

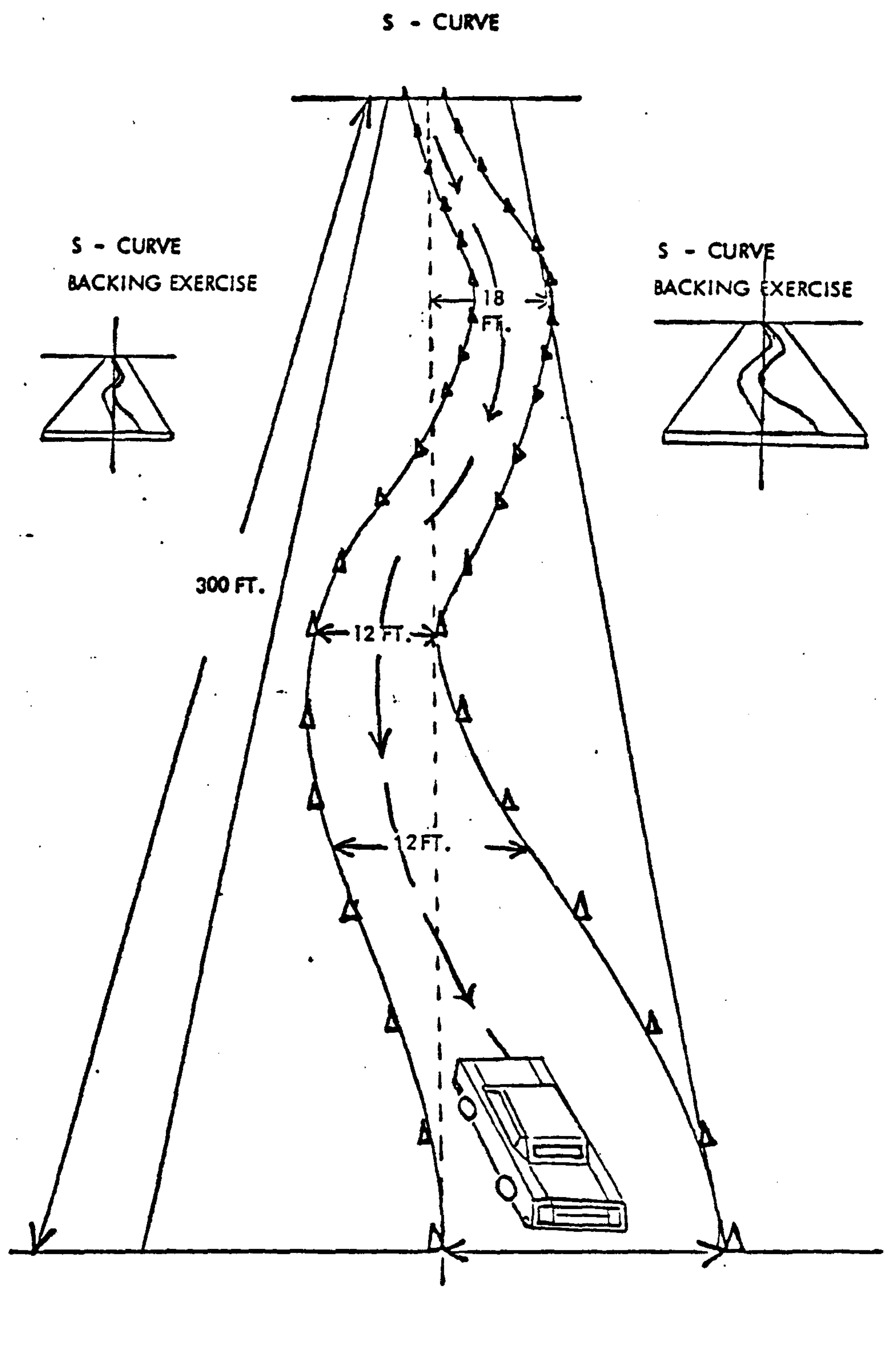

Figure 4

S-Curve Backing Exercise

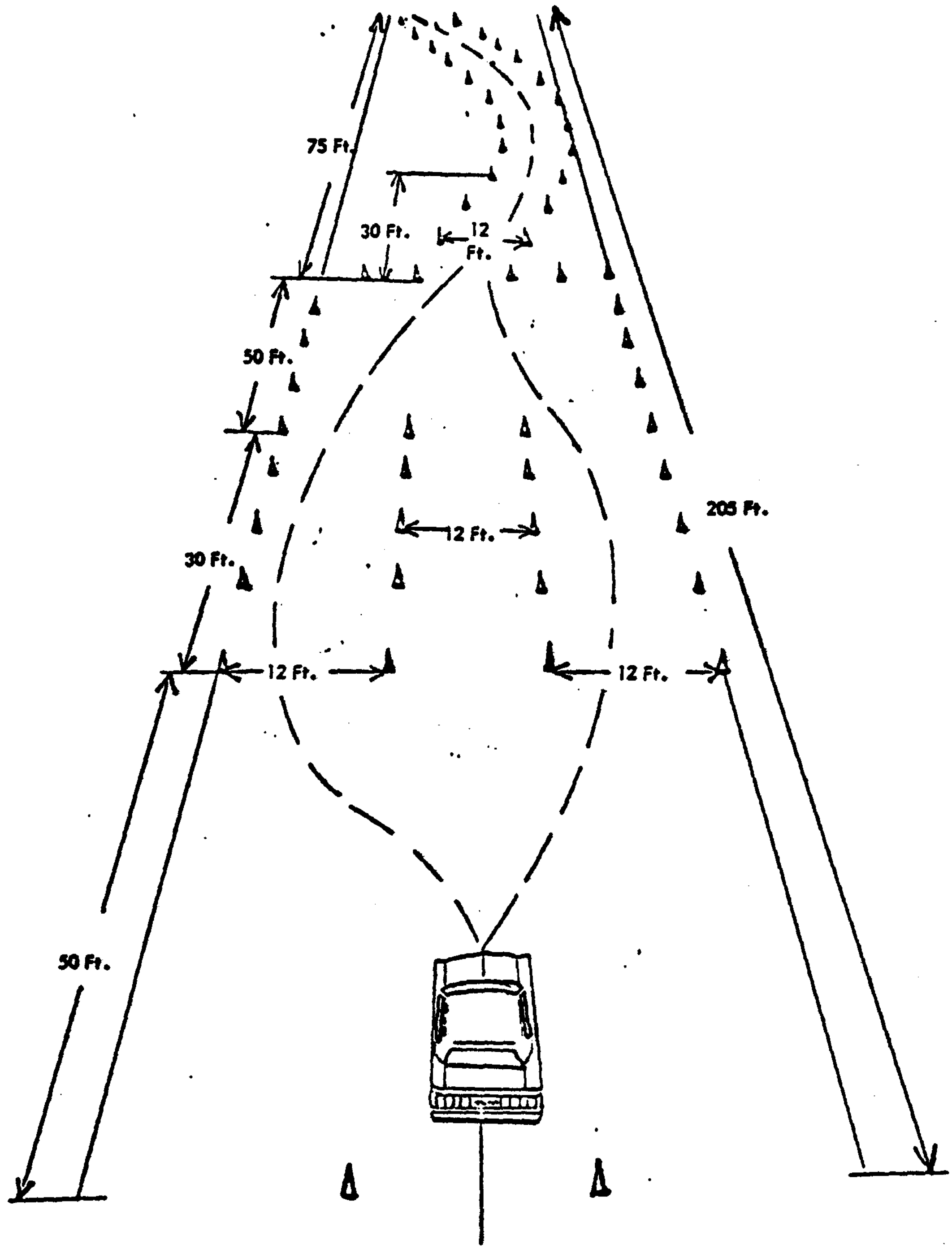

Figure 5

Evasive Exercise

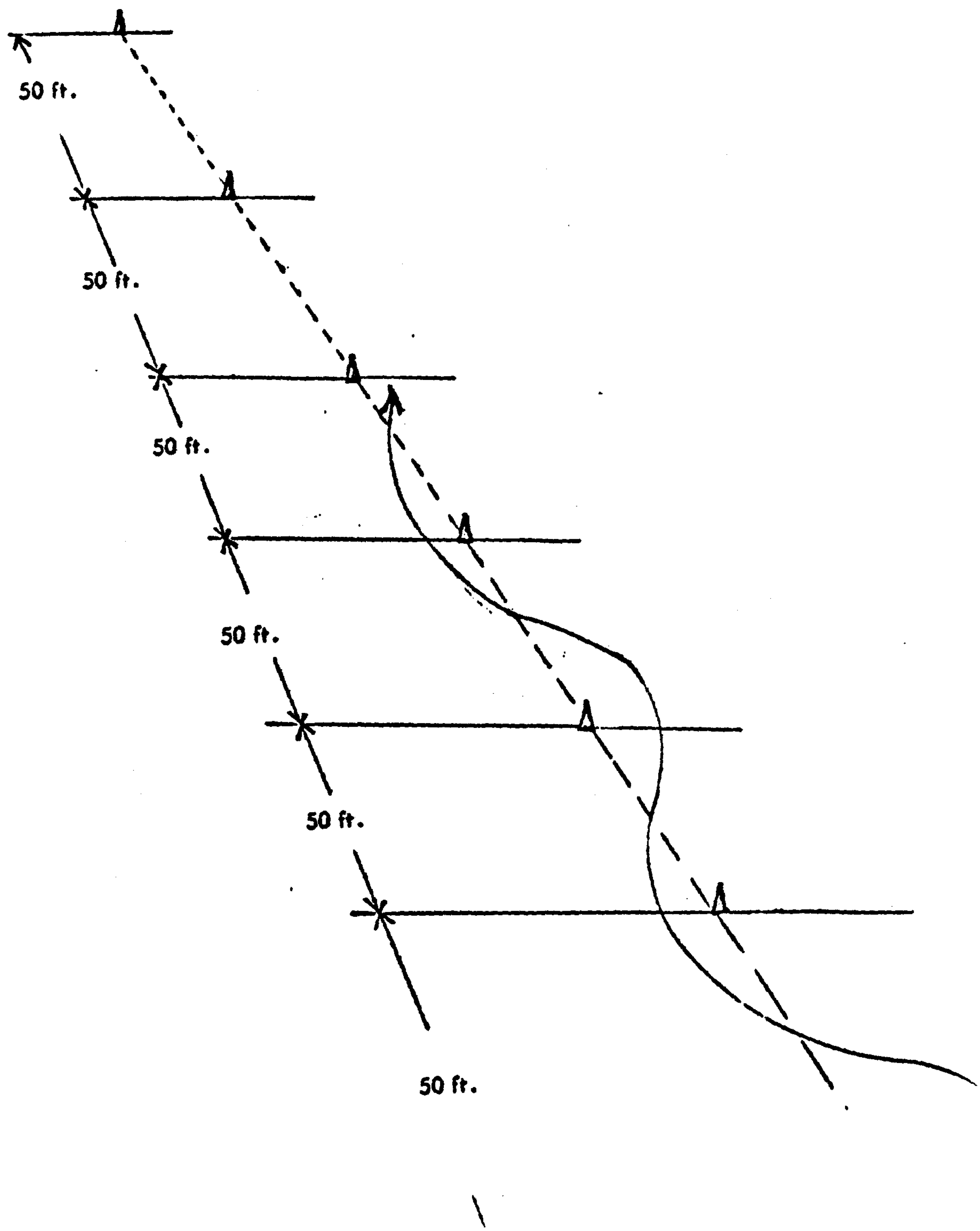

Figure 6

Serpentine

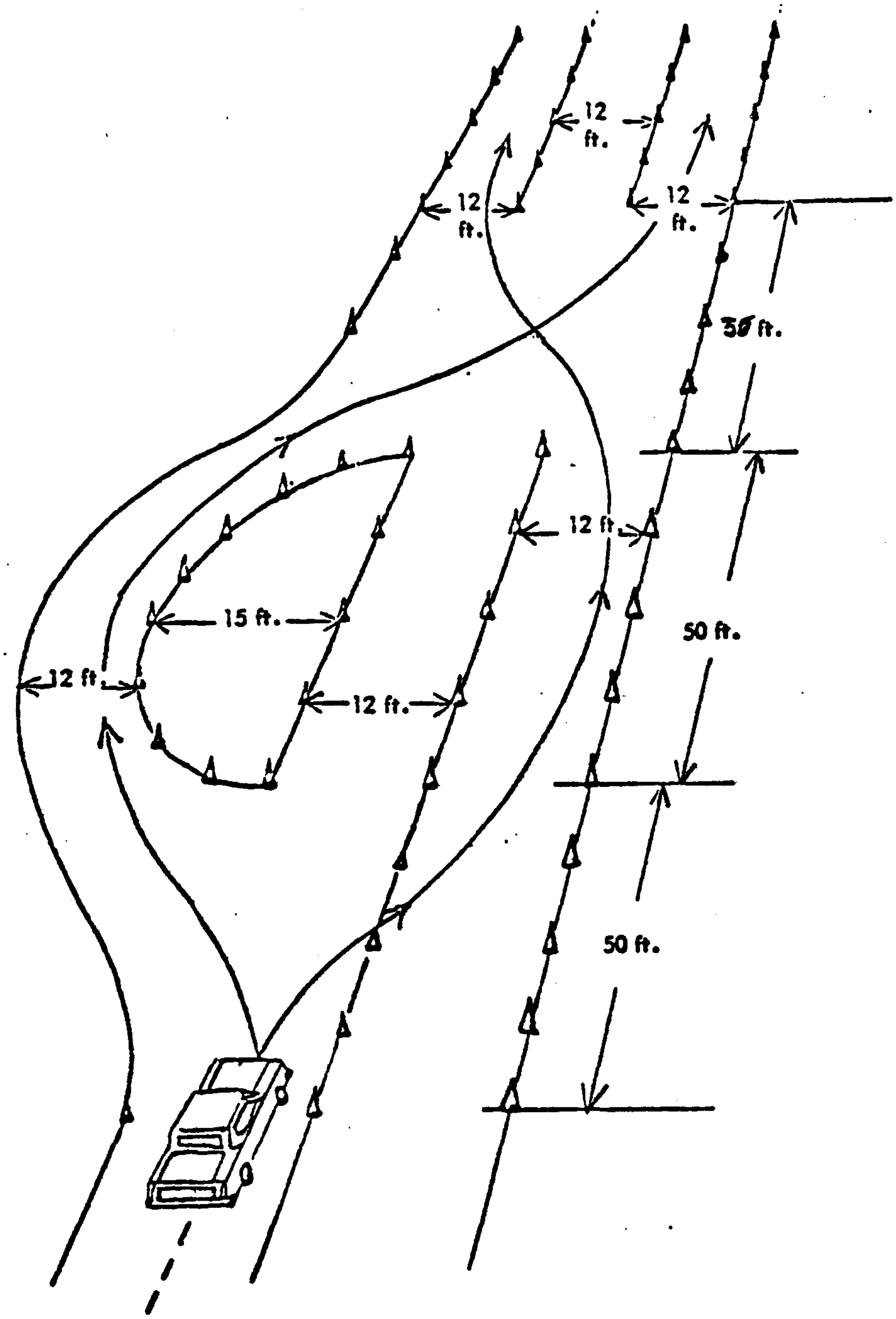

Figure 7

Controlled Brake

differences between the compared variables.

Computations and comparisons of accident rates were made for the following pairs of predictor variables:

Control group (not treatment) vs. Experimental group (treatment)
Comparisons by Age groups
Comparisons based on self reported annual mileage
Comparison based on business mileage
Comparison based on private mileage
Males vs. Females

SUMMARY

A quasi scientific study was conducted using an ex post facto design that allowed for comparisons between a control and experimental group and a variety of other predictor variables. These comparisons of accident records provided a means of appraising the impact of the Police Emergency Driving Program at St. Cloud State University on the driving records of treated subjects. More detailed analysis follows in Chapter 4.

Chapter 4

ANALYSES OF THE DATA

In the previous chapter the scope and dimensions of the treatment provided the experimental group were described. In this chapter the findings and interpretations to these findings will be presented.

A control group and an experimental group were established. The control group consists of 249 individuals, and the experimental group consists of 189 individuals. Due to circumstances beyond the control of the author, the sample is over represented by male subjects. Of the 189 members of the experimental group, only three are women. The control group has only two women in the total of 249. This over representation limits the findings to similar highly male groups of police officers. This over representation appears to be the result of conditions and employment opportunities that exist in police work in Minnesota.

Once selection, treatment or assignment, and a sufficient time period had passed, the data were collected. Since the accuracy of the data are critical to the findings, the author will briefly explain the procedures used to insure accuracy. Step one involved the recording of the driver's license numbers of each subject. The source for this information was a registration form used at the time of assignment or treatment. Step two consisted of submitting these numbers to the Department of Public Safety records section. The official driving records were provided. Through these records, the following information was obtained:

Driver's license number
Number of accidents during the four year time period
Dates of the accidents
Accident number
License plate number of the vehicle being driven

In addition to the information from the official driving record, self reported annual business and private miles driven were placed on computer cards. These cards served as the data for statistical calculations.

The data were reviewed at each step to insure accuracy. As a result of this process, driving records were collected for 189 of 190 assigned to the experimental group and 249 of 251 for the control group. The author has been assured that this type of return is remarkably high for this type of data retrieval.

The remaining sections of this chapter will follow the general format of making a statement of general findings which will be followed by interpretations; the specific findings will be treated in the same manner.

GENERAL FINDINGS

Finding - Accidents Prior to Treatment

Based on experience before treatment, the experimental group had significantly more accidents than the control group did (see Table 1).

Interpretation

It appears that members of the experimental group represent a higher accident rate group than the control group. The author speculates that this difference is the result of the methods that individual police agencies used in the selection of the police officers who attended the training program first. The data strongly indicates that police agencies sent their high accident personnel to the program first. The control group was selected and assigned two years after the experimental group. It is further speculated that sufficient time had passed to allow most agencies to begin sending officers with lower accident frequencies to the training program.

Table 1

Accidents Prior to Treatment

Number of Accidents	Experimental Column Percent	Control Column Percent	Column Percent Difference
0	113	179	
	59.8	71.9	-12.1
1	55	58	
	29.1	23.3	+ 5.8
2	21	12	
	11.1	4.8	+ 6.3
Column Total	189	249	

Chi Square = 9.41 2 df $p \leq .01$

Finding - Pre/Post Comparison of Experimental Group Accidents

The experimental group improved their table accident record by 26.8 percent when comparing the two years prior to treatment to the two years following treatment (see Table 2).

Interpretation

The author has chosen to report this finding even though it is not a common practice to report findings with significance levels above .10. It is the author's view that the change in the experimental group was deserving of consideration by the reader. In interpreting this finding, it is important to remember that the relationship between the control and experimental groups based on total accident experiences in two separate two-year periods changed from being significantly different at the .01 level of significance to no significant difference following treatment. In light of these findings, treatment has had a beneficial effect on reducing the total accident involvement of the experimental group in the two years following treatment.

Table 2

Pre/Post Comparison of Experimental Group Accidents

Number of Accidents	Pre Experimental Column Percent	Post Experimental Column Percent	Column Percent Difference
0	113	131	
	59.8	69.3	+9.5
1	55	45	
	29.1	23.8	-5.3
2	21	13	
	11.1	6.9	-4.2
Column Total	189	189	
Total No. of Accidents	97	71	26.8% reduction

Chi Square = 4.21   2 df $p \leq .125$

Finding - Pre/Post Comparisons of Control Group Accidents

There was no significant change in the control group's total accident experience when comparing the two years prior to assignment to the two years following assignment (see Table 3).

Interpretation

It appears the control group has not changed sufficiently to account for the change in the relationship between control and experimental groups following treatment. With the two previous findings considered, this finding lends support to the interpretation that treatment has had a beneficial effect on the total accident experiences of the experimental group. If adjustment is made for the control group's 3.7 percent reduction in total accidents, this still leaves an adjusted 23.1 percent reduction in total accidents within the experimental group.

Table 3

Pre/Post Comparisons of Control Group Accidents

Number of Accidents	Pre Control Column Percent	Post Control Column Percent	Column Percent Difference
0	179	182	
	71.9	73.1	+1.2
1	58	55	
	23.2	22.1	-1.2
2	12	12	
	4.8	4.8	0
Column Total	249	249	
Total No. of Accidents	82	79	3.7% reduction

Chi Square = .10 2 df NSD

SPECIFIC FINDINGS

Finding - Private Accident Experiences

On both pre and post treatment comparisons between[1] the control and experimental groups no significant difference was discovered on private accident experiences. There were no significant differences within[2] the groups (see Appendix, p. 78).

Interpretation

The data strongly indicates that treatment did not change the private accident experience of the control and experimental groups. Treatment appears to have had no significant effect on private accident experiences of the experimental group.

Finding - Business Accident Experiences:
1) Control vs. Experimental Pre

When business accidents are used as a basis of comparison, the control and experimental groups differed significantly prior to treatment (see Table 4).

Interpretation

The experimental group has significantly more accidents than the control group. It has been speculated that the reason for this significant difference was the methodology police agencies used in selection of police officers who attended the training program. The

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[1]For the purpose of this study, between will always mean control vs. experimental.

[2]For the purpose of this study, within will always mean pre vs. post treatment comparisons.

speculation is reinforced by this finding. It seems appropriate that high business accident individuals would be selected to be trained first, and the data indicates this is what could account for the significant difference between the groups.

Table 4

Business Accident Experiences: 1) Control vs. Experimental Pre

Number of Accidents	Experimental Column Percent	Control Column Percent	Column Percent Difference
0	168	239	
	88.9	96.0	+ 7.1
1	19	10	
	10.1	4.0	- 6.1
2	2	0	
	1.1	0	- 1.1
Column Totals	189	249	

Chi Square = 9.13   2 df $p \leq .01$

Finding - Experimental Pre/Post

2

Further comparisons show the experimental group had fourteen more business accidents prior to treatment than after treatment. A significant difference exists within the experimental group on pre to post treatment comparison (see Table 5).

Interpretation

Treatment has had a beneficial effect on the business accident experiences of the experimental group. This finding is extremely important since the primary purpose of this program was to effect a positive change in business accident experience of the treated group.

Table 5

Experimental Pre/Post

Number of Accidents	Pre Experimental Column Percent	Post Experimental Column Percent	Column Percent Difference
0	168	180	
	88.9	95.2	+ 6.3
1	21	9	
	11.1	4.8	- 6.3
Column Totals	189	189	
Total Accidents were Reduced by:		61.9&	
Chi Square = 5.21	1 df	$p \leq .10$	

Finding: Control Pre/Post

Support is gained for the previous finding when no significant difference exists within the control group on pre and post treatment comparisons (see Table 6).

Interpretation

With no significant change within business accident experience in the control group, and with the significant reduction of business accidents within the experimental group, treatment has had a significant beneficial effect on business accident experience.

Table 6

Control Pre/Post

Number of Accidents	Pre Control Column Percent	Post Control Column Percent	Column Percent Difference
0	239	292	
	96	97.2	+ 1.2
1	10	7	
	4	2.8	- 1.2
Column Totals	249	249	
Total Accidents were Reduced by:		30%	

Chi Square = .548 1 df NSD

Finding - Age and Total Accident Comparisons

There was no significant difference between control and experimental groups based on age distributions and accident frequencies (see Table 7).

Interpretation

Since no significant difference exists in age distributions between the control and experimental groups, age distributions should not account for any difference between the control and experimental groups.

Table 7

Age and Total Accident Comparisons

Age Group	Experimental Column Percent	Control Column Percent	Column Percent Difference
17-25	38	65	
	20.1	26.1	+ 6
26-33	98	125	
	51.9	50.2	- 1.7
34-41	35	36	
	18.5	14.5	- 4.0
42-65	18	23	
	9.5	9.2	- .3
Column Totals	189	249	

Chi Square = 2.80 3 df NSD

Finding - Experimental Accidents by Age Categories, Pre

Based on a total accident comparison prior to treatment, the experimental group had two age groups which were significantly over represented in accident involvement (see Table 8). The control group showed no significance difference in these same age group comparisons (see Appendix, p. 81).

Interpretation

Factors beyond the perception of the author appear to have resulted in the over involvement in accidents of the 17-25 year old and 34-41 year old age groups. Since individual departments made the choice of who to send to training first, it is impossible to account for this distribution. The 17-25 year old age group is commonly over represented when accidents are analyzed, but the over representation of the 34-41 year old age group is quite difficult to account for when interpreting this finding.

Table 8

Experimental Accidents by Age Categories, Pre

Number of Accidents	17-25	Column Percent	26-33	Column Percent	34-41	Column Percent	42-65	Column Percent
0	19	50.0	66	34.9	16	45.7	12	66.7
1	15	39.5	19	19.4	15	42.9	6	33.3
2	4	10.5	13	13.3	4	11.4	0	0
Column Totals	38		98		35		18	

Chi Square = 12.24   6 df $p \leq .10$

Finding - Experimental Accidents by Age Categories, Post

Following treatment the over involvement in accidents of the 17-25 year olds and the 34-41 year olds did not appear (see Table 9).

Interpretation

Treatment has had the effect of changing a significant over involvement of two age groups in accidents to a no significant difference distribution. It appears treatment has had its greatest effect in these two age groups which were over represented prior to treatment. Further clarity will be added in later findings and interpretations.

Table 9

Experimental Accidents by Age Categories, Post

Number of Accidents	17-25	Column Percent	26-33	Column Percent	34-41	Column Percent	42-65	Column Percent
0	28	73.7	66	67.3	26	74.3	11	61.1
1	7	18.4	24	24.5	9	25.7	5	27.8
2	3	7.9	8	8.2	0	0	2	11.1
Column Totals	38		98		35		18	

Chi Square = 4.28 6 df NSD

Finding - 26 to 33 Age Group Comparisons, Pre

When further comparisons between the control and experimental groups were made using matched age groups, only one of the four age group comparisons revealed a significant difference between control and experimental. This significant difference was in the 26 to 33 year age group (see Table 10).

Interpretation

The difference appears to be the result of the experimental group's under representation in the single accident category and its over representation in the multiple accident category. It is difficult to account for this finding. Similar to the previous interpretation of significant difference between control and experimental groups, the selection process used by individual police agencies may have influenced this finding. Further analysis of the data should assist in interpreting this finding.

Table 10

26 to 33 Age Group Comparisons, Pre

Number of Accidents	Experimental Column Percent	Control Column Percent	Column Percent Difference
0	66	93	
	67.3	74.4	+ 7.1
1	19	27	
	19.4	21.6	+ 2.2
2	13	5	
	13.3	4.0	- 9.3
Column Totals	98	125	

Chi Square = 6.36   2 df $p \leq .05$

Finding - 26 to 33 Age Comparisons, Post

Following treatment, no significant difference existed between the control and experimental 26-33 year old accident experience (see Table 11).

Interpretation

Treatment has had an apparent effect in shifting the multiple accident individuals to the one or zero accident categories. This shift downward in the number of accidents experienced by the experimental 26-33 year age group indicates a possible beneficial effect from treatment.

Table 11

26 to 33 Age Comparisons, Post

Number of Accidents	Experimental Column Percent	Control Column Percent	Column Percent Difference
0	66	91	
	67.3	72.8	+ 5.5
1	24	26	
	24.5	20.8	- 3.7
2	8	8	
	8.2	6.4	- 1.8
Column Totals	98	125	

Chi Square = .80 2 df NSD

Finding - Control and Experimental Pre/Post Comparison for 26-33 Year Olds

There was no significant differences on pre and post treatment comparisons between the control and experimental 26-33 year age groups (see Table 12).

Interpretation

The change in accident experiences between the control and experimental 26-33 age group was not the result of a significant change within the control or experimental group.

Table 12

Control and Experimental Pre/Post
Comparison for 26-33 Year Olds

Number of Accidents	Pre Experimental Column Percent	Post Experimental Column Percent	Column Percent Difference
0	66	66	
	67.3	67.3	0
1	19	24	
	19.4	24.5	+ 5.1
2	13	8	
	13.3	8.2	- 5.1
Column Totals	98	98	
Total Acciednts	45 Pre	40 Post	22% reduction
Chi Square = 1.77	2 df	NSD	

Finding - 17 to 25 Age Group Comparisons for Experimental Group Accidents

Even though no significant difference existed between the control and experimental 17-25 year olds, pre and post treatment, further analysis revealed a significant difference within the experimental group 17-25 year olds on pre to post treatment comparison (see Table 13).

Interpretation

The data indicates treatment had a significant effect by reducing the experimental group 17-25 year olds' total accident experiences. This interpretation is supported by the finding that the control group's 17-25 year olds did not experience a significant change in the number of accidents as a result of treatment (see Appendix, p. 91).

Table 13

17 to 25 Age Group Comparisons for Experimental Group Accidents

Number of Accidents	Pre Experimental Column Percent	Post Experimental Column Percent	Column Percent Difference
0	19	28	
	50.0	78.9	+ 28.9
1	15	7	
	39.5	14.2	- 25.3
2	4	3	
	10.5	7.9	- 2.6
Column Totals	38	38	
Total Accidents	23	13	22% reduction

Chi Square = 4.78 2 df $p \leq .10$

Finding - 33 to 41 Age Group Comparisons for Experimental Group Accidents

The other age group that experienced a significant change as a result of treatment was the 34-41 year olds. The significant change was the reduction of the number of accidents following treatment (see Table 14).

Interpretation

Treatment had a beneficial effect in reducing accident frequency for the treated experimental 34-41 age group. This interpretation was supported by the finding that no significant changes occurred within the control group's identical age group (see Appendix, p. 92).

Treatment significantly reduced accident frequency for the 17-25 and the 34-41 year olds who were treated. It should be remembered that both the 17-25 and 34-41 year olds in the experimental group were over represented in accident involvement prior to treatment. These findings clearly indicate that treatment had its greatest effect on the high-accident age groups.

Table 14

33 to 41 Age Group Comparisons for
Experimental Group Accidents

Number of Accidents	Pre Experimental Column Percent	Post Experimental Column Percent	Column Percent Difference
0	16	26	
	45.7	74.3	+ 29.4
1	19	9	
	54.3	25.7	- 29.4
Column Totals	35	35	
Total Accidents	23	9	67% reduction

Chi Square = 5.96 1 df $p \leq .05$

<u>Finding - Age Comparisons and Private Accident Experience</u>

In the analysis of private accident experiences of the various age categories, one significant difference existed between the control and experimental groups. That difference occurs in the post treatment comparison of the 17-25 year olds (see Table 15).

<u>Interpretation</u>

This significant difference is particularly important when considered in light of the finding that no significant difference existed prior to treatment (see Appendix, p. 92). With the change from no significant difference to significant difference, and the data showing a reduction in accidents for the experimental 17-25 year olds, it appears treatment has had a beneficial effect on accident experiences of the treated group.

Table 15

Age Comparisons and Private Accident Experience

Number of Accidents	Experimental Column Percent	Control Column Percent	Column Percent Difference
0	35	49	
	92.1	75.4	- 17.7
1	2	14	
	5.3	21.5	+ 16.2
2	1	2	
	2.6	3.1	+ 1.5
Column Totals	38	65	

Chi Square = 4.93 2 df $p \leq .10$

<u>Finding - Experimental 17-25 Year Olds Pre/Post Private Accidents</u>

The 17-25 year olds in the experimental group experienced a significant reduction in accidents following treatment (see Table 16).

<u>Interpretation</u>

When the previous findings were considered, treatment had a significant positive effect on the reduction of private accidents for the experimental group's 17-25 year olds.

Table 16

Experimental 17-25 Year Olds Pre/Post Private Accidents

Number of Accidents	Pre Experimental Column Percent	Post Experimental Column Percent	Column Percent Difference
0	30	35	
	78.9	92.1	+ 13.2
1	8	3	
	22.1	7.9	- 13.2
Column Totals	38	38	
Total Accidents	10	4	60% reduction
Chi Square = 4.84	1 df	$p \leq .10$	

SELF REPORTED MILEAGE COMPARISONS

The control and experimental groups did not differ significantly in reported annual business and private miles traveled (see Appendix, p.

The importance of this finding is that the control and experimental groups were similar in reported mileage distributions. This means that the control and experimental groups differ in only one of the variables used for comparison purposes. This difference in accident frequency has already been reported, and the implications are clear. Treatment had a beneficial effect by reducing the accident frequency of the experimental group, while the control group remained stable.

No significant differences exist in private accident frequency when compared to the mileage categories. No mileage category is over represented on the pre and post treatment comparisons (see Appendix, p.

Meaningful comparisons in the business mileage category are impossible because the sample size and the accident frequencies are too small for valid statistical treatments.

The findings and interpretations reported in this chapter will be summarized in Chapter 5.

Chapter 5

SUMMARY, RECOMMENDATIONS, AND CONCLUSIONS

Chapter 1 of this study has described the conditions that contribute to and cause the involvement of police officers in Highway Transportation System collisions. It has been shown that:

1. As a group of drivers, police officers receive little or no special preparation in driving skills.
2. As a group of drivers, police officers are not immune to accident involvement.
3. Police officers' jobs require operation of motor vehicles in a variety of high risk situations.
4. The potential for improved performance in accident avoidance and cost reduction exists.

Moreover, this study appraised the impact of the Police Emergency Driver Training Program at St. Cloud State University on the collision experience of some Minnesota police officers.

Four critical aspects of this study were scrutinized in the review of the literature. While it was noted that a paucity of similar studies exist, there is considerable interest in the traffic safety community in emergency driving for police officers. Potential for the improvement of police emergency driving has been identified. The appropriateness of and guidelines for the use of simulation in an emergency driving program were explored. Finally, cautions and limitations of accident records as an evaluative criterion were identified.

The study was ex post facto in design, and several limitations have been identified. These limitations are summarized below:

1. The lack of random assignment to control and experimental groups;
2. The exclusive use of subjects who requested training as members of the control and experimental groups;
3. The lack of control for changes in occupation, duty assignment, departmental procedures, and the environment for driving.

The study was limited to comparisons between and among two groups of Minnesota police officers. These comparisons were based on the following variables:

1. Sex
2. Age
3. Self reported mileage
4. Private, business, unknown, and total accident experiences.

One hundred eighty nine members of the experimental group were treated with a three-day program of instruction and practice driving. Two hundred forty-nine subjects were assigned to the control group two years after the experimental group was treated. The treatment and assignment procedures were described in Chapter 3. These procedures were:

1. Police officers reporting for training between June 1, 1975 and November 30, 1975 were treated and became the experimental group.

2. Police officers who reported for training between June 1, 1977 and November 20, 1977 were assigned to the control group.

3. The experimental group received training in the following areas:

   a. serpentine
   b. off road recovery
   c. evasive actions
   d. controlled braking
   e. skid control
   f. backing
   g. pursuit driving

4. The control group received no training for the four years covered by the study.

5. The experimental group's training dates divide the years covered by the study into two two-year time periods.

6. The control group was assigned imagined training dates that divided the four-year time period into two two-year observation periods.

7. The time periods for both the control and experimental groups cover the same time period.

The analysis of data and interpretation of findings were described in Chapter 4 of this paper. Some important considerations described in Chapter 4 were:

1. Official driver license records were used as the primary source of data.

2. Secondary data sources were self-reported business and private annual miles traveled.

3. Safeguards were used for insuring accuracy of the data.

4. The major findings and interpretations of these findings were presented.

The major findings were reported and interpreted in concert with the following hypotheses:

<u>General</u>: Emphasis on practice and instruction in simulated emergency situations will lead to improved performance in associated real world situations.

<u>Working</u>: Emphasis on practice and instruction in simulated emergency situations will lead to a significant difference between the performance of trained and untrained individuals and groups of individuals in real world situations.

<u>Null</u>: There will be no difference between performance of trained individuals and untrained individuals or groups.

The null hypothesis was rejected in all cases.

Therefore, the working hypothesis is accepted for:

1. Business Accidents on total group comparison
2. Private accidents for the 17-25 year olds
3. Total accidents for the 17-25 and 34-41 year olds

Whereas, the working hypothesis is rejected for the following:

1. Total accident experience for the total group
2. Private accident experience for the total group

Finally, the general hypothesis has been accepted based on the major findings of the study.

The author accepts the fact that emphasis on practice and instruction of simulated emergency skills can lead to improved performance in associated real world situations.

In summary, the major findings of the study were:

1. The control and experimental groups differ significantly in accident experience prior to treatment.

2. The control and experimental groups did not differ significantly in age, sex, and reported mileage variables.
3. Following treatment, the experimental and control groups did not differ significantly in total accident experience.
4. The experimental group improved on its total accident experiences by 28 percent. This improvement was nearly significant at the .10 level of significance.
5. The control group improved its total accident experiences by 3.7 percent. This improvement was not significant.
6. The private accident experience of the control and experimental groups did not differ significantly on pre and post treatment comparisons.
7. The business accident experiences of the control and experimental groups were significantly different prior to treatment.
8. The business accident experience of the experimental group is significantly higher than the control group prior to treatment.
9. Following treatment, the control and experimental groups were not significantly different in frequency of business accidents.
10. The experimental group improved its business accident experiences by 61.9 percent. This improvement was significant at the .10 level of significance.
11. The 17-25 year olds within the experimental group improved their total accident experience by 43.5 percent. This

improvement was significant at the .10 level of significance.

12. The 33-41 year olds within the experimental group improved their total accident experience by 67 percent. This improvement was significant at the .10 level.

13. The 17-25 year olds were significantly different based on accident comparisons following treatment at the .10 level of significance.

14. The 17-25 year olds within the experimental group improved their private accident experience by 60 percent. This improvement was significant at the .10 level of significance.

15. Findings for business and unknown accident categories were impossible to interpret when age and mileage were used as variables. This was the result of the small number of reported accidents in these categories.

RECOMMENDATIONS

Based on the findings and insights gained by the author through conducting this study, the following list of recommendations is offered:

1. A true scientific study of this type of program should be undertaken. This new study should:

   a. randomly select subjects for assignment to control and experimental groups
   b. control for the previously listed limitations
   c. develop and use intermediate and long term evaluation criteria.

2. Further in-depth analysis of the specific types of accidents the subjects experienced, pre and post treatment, would reveal the exact impact of this type of program on specific accident types.

3. Further study to determine if the program has potential for other populations is recommended. Particular emphasis should be placed on the 17-25 year old driving public.

4. Further study to determine the optimum program structure should include considerations for:

   a. length of program
   b. use of classroom time
   c. use of film simulation.

5. Further study to determine the long term retention of the skill learned in programs of this type is recommended.

6. Examination of the potential of refresher courses is recommended.

CONCLUSION

This scientific study was conducted to appraise the impact of the St. Cloud State University Police Emergency Driving Program on two groups of Minnesota police officers. It was found that the program had a beneficial impact on the addicent frequency of the treated subjects, and that specific groups within the experimental group experienced statistically significant improvement. The author believes programs of this type deserve serious consideration as accident countermeasures, and that further scientific investigations will lead to improved understanding of the impact that emergency driving has on accidents.

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APPENDIX

PRIVATE ACCIDENTS
CONTROL VS. EXPERIMENTAL

Number of Accidents	Experimental Column Percent	Control Column Percent	Column Percent Difference
		Pre	
0	159	195	
	84.1	78.3	- 5.8
1	26	47	
	13.8	18.9	+ 5.1
2	4	7	
	2.1	2.8	+ .7
Column Totals	189	249	
Chi Square = 2.35	2 df	Sig. = .3096	
		Post	
0	155	194	
	82.0	77.9	- 4.1
1	28	48	
	14.8	19.3	+ 4.6
2	6	7	
	3.2	2.8	- .6
Column Totals	189	249	
Chi Square = 1.51	2 df	Sig. = .4706	

BUSINESS ACCIDENTS
CONTROL VS. EXPERIMENTAL

Number of Accidents	Experimental Column Percent	Control Column Percent	Column Percent Difference
		Post	
0	180	242	
	95.2	97.2	+ 2
1	9	7	
	4.8	2.8	- 2
Column Totals	189	249	

Chi Square = .673 1 df Sig. = .4118

UNKNOWN ACCIDENTS
CONTROL VS. EXPERIMENTAL

Number of Accidents	Experimental Column Percent	Control Column Percent	Column Percent Difference
	Pre		
0	157	239	
	83.0	96.0	+ 13.0
1	27	10	
	14.3	4.0	- 10.3
2	5	0	
	2.7	0	- 2.7
Column Totals	189	249	
Chi Square = 21.98	2 df	Sig. = .000	
	Post		
0	160	238	
	84.7	95.6	+ 10.9
1	27	11	
	14.3	4.4	- 9.9
2	2	0	
	1	0	- 1
Column Totals	189	249	
Chi Square = 16.11	2 df	Sig. = .0003	

CONTROL ACCIDENTS
PRE ASSIGNMENT BY AGE GROUPS

Number of Accidents	17-25 Number Column Percent	26-33 Number Column Percent	34-41 Number Column Percent	42-65 Number Column Percent
0	44	92	24	18
	67.7	74.4	66.7	79.3
1	17	27	10	4
	26.2	21.6	27.8	17.4
2	4	5	2	1
	6.2	4.0	5.6	4.3
Total	65	125	36	23

Chi Square = 2.04 6 df Sig. = .0000

CONTROL ACCIDENTS
POST ASSIGNMENT BY AGE GROUPS

Number of Accidents	17-25 Number Column Percent	26-33 Number Column Percent	34-41 Number Column Percent	42-65 Number Column Percent
0	44	91	27	20
	67.7	72.8	75.0	87.0
1	19	26	8	2
	29.2	20.8	22.2	8.7
2	2	8	1	1
	3.1	6.4	2.8	4.3
Total	65	125	36	23

Chi Square = 5.73 6 df Sig. = .4546

CONTROL PRIVATE ACCIDENTS
BY AGE GROUPS

Number of Accidents	17-25 Number Column Percent	26-33 Number Column Percent	34-41 Number Column Percent	42-65 Number Column Percent
		Pre		
0	46	99	29	20
	70.8	79.2	80.6	87.0
1	16	22	7	3
	24.6	17.6	19.4	13.0
2	3	4	0	0
	4.6	3.2	0	0
Totals	65	125	36	23

Chi Square = 4.81   6 df   Sig. = .5682

Number of Accidents	17-25 Number Column Percent	26-33 Number Column Percent	34-41 Number Column Percent	42-65 Number Column Percent
		Post		
0	49	95	30	21
	75.4	76.0	83.3	91.3
1	14	25	6	2
	21.5	20.0	16.7	8.7
2	5	0	0	0
	3.1	4.0	0	0
Totals	65	125	36	23

Chi Square = 4.76   6 df   Sig. = .5756

EXPERIMENTAL PRIVATE ACCIDENTS
BY AGE GROUPS

Number of Accidents	17-25 Number Column Percent	26-33 Number Column Percent	34-41 Number Column Percent	42-65 Number Column Percent
		Pre		
0	30	81	28	16
	78.9	82.7	80	89.9
1	6	14	6	2
	15.8	14.3	17.1	11.1
2	2	3	1	0
	5.3	3.1	2.9	0
Totals	38	98	35	18

Chi Square = 1.62   6 df   Sig. = .9514

Number of Accidents	17-25 Number Column Percent	26-33 Number Column Percent	34-41 Number Column Percent	42-65 Number Column Percent
		Post		
0	35	80	31	13
	92.1	81.6	88.6	72.2
1	2	16	4	4
	5.3	16.3	11.4	22.2
2	1	2	0	1
	2.6	2.0	0	5.6
Totals	38	98	35	18

Chi Square = 6.08   6 df   Sig. = .4142

CONTROL BUSINESS ACCIDENTS
BY AGE GROUP

Number of Accidents	17-25 Number Column Percent	26-33 Number Column Percent	34-41 Number Column Percent	42-65 Number Column Percent
Pre				
0	63	120	33	23
	96.9	96.0	91.7	100
1	2	5	3	0
	3.1	4.0	8.3	0
Totals	65	125	36	23
Chi Square = 2.85	3 df	Sig. = .4150		
Post				
0	63	121	35	23
	96.9	96.8	97.2	100
1	2	4	1	0
	3.1	3.2	2.8	0
Totals	65	125	36	23
Chi Square = .751	3 df	Sig. = .8611		

EXPERIMENTAL BUSINESS ACCIDENTS
BY AGE GROUPS

Number of Accidents	17-25 Number Column Percent	26-33 Number Column Percent	34-41 Number Column Percent	42-65 Number Column Percent
Pre				
0	34	88	30	16
	89.5	89.8	85.7	88.9
1	3	9	5	2
	7.9	9.2	14.3	11.1
2	1	1	0	0
	2.6	1	0	0
Totals	38	98	35	18

Chi Square = 2.39 6 df Sig. = .8800

Number of Accidents	17-25	26-33	34-41	42-65
Post				
0	36	92	34	18
	94.7	93.9	97.1	100
1	2	6	1	0
	5.3	6.1	2.9	0
Totals	38	98	35	18

Chi Square = 1.60 3 df Sig. = .6592

CONTROL UNKNOWN ACCIDENTS
BY AGE GROUPS

Number of Accidents	17-25 Number Column Percent	26-33 Number Column Percent	34-41 Number Column Percent	42-65 Number Column Percent
Pre				
0	64	123	32	20
	98.5	98.4	88.9	87.0
1	1	2	4	3
	1.5	1.6	11.1	13.0
Totals	65	125	36	23
Chi Square = 12.49	3 df	Sig. = .0059		
Post				
0	62	122	33	21
	95.4	97.6	91.7	91.3
1	3	3	3	2
	4.6	2.4	8.3	8.7
Totals	65	125	36	23
Chi Square = 3.515	3 df	Sig. = .3188		

EXPERIMENTAL UNKNOWN ACCIDENTS
BY AGE GROUPS

Number of Accidents	17-25 Number Column Percent	26-33 Number Column Percent	34-41 Number Column Percent	42-65 Number Column Percent
		Pre		
0	29	86	26	16
	76.3	87.8	74.3	88.9
1	9	9	7	2
	23.7	9.2	20.0	11.1
2	0	3	2	0
	0	3.1	5.7	0
Totals	38	98	35	18

Chi Square = 8.72 6 df Sig. = .1900

Number of Accidents	17-25 Number Column Percent	26-33 Number Column Percent	34-41 Number Column Percent	42-65 Number Column Percent
		Post		
0	30	84	31	15
	78.9	85.7	88.6	83.3
1	7	13	4	3
	18.4	13.3	11.4	16.7
2	1	1	0	0
	2.6	1.0	0	0
Totals	38	98	35	18

Chi Square = 2.48 6 df Sig. = .8712

EXPERIMENTAL VS. CONTROL TOTAL ACCIDENTS
FOR 17-25 YEAR OLDS

Number of Accidents	Experimental Column Percent	Control Column Percent	Column Percent Difference
	Pre		
0	19	15	
	50.0	67.7	- 17.7
1	15	17	
	39.5	26.2	- 13.3
2	4	4	
	10.5	6.2	- 4.3
Totals	38	65	
Chi Square = 3.19	2 df	Sig. = .2032	
	Post		
0	28	44	
	73.7	67.7	- 6.0
1	7	19	
	18.4	29.2	+ 10.8
2	3	2	
	7.9	3.1	- 3.8
Totals	38	65	
Chi Square = 2.38	2 df	Sig. = .3042	

EXPERIMENTAL VS. CONTROL TOTAL ACCIDENTS
FOR 34-41 YEAR OLDS

Number of Accidents	Experimental Column Percent	Control Column Percent	Column Percent Difference
	Pre		
0	16	24	
	45.7	66.7	+ 21
1	15	10	
	42.9	27.8	- 15.1
2	4	2	
	11.4	5.6	- 5.8
Totals	35	36	
Chi Square = 3.25	2 df	Sig. = .1966	
	Post		
0	26	27	
	74.3	75.0	+ .7
1	9	8	
	25.7	22.2	- 2.5
2	0	1	
	0	2.8	+ 2.8
Totals	35	36	
Chi Square = 1.06	2 df	Sig. = .7175	

EXPERIMENTAL VS. CONTROL TOTAL ACCIDENTS
FOR 42-65 YEAR OLDS

Number of Accidents	Experimental Column Percent	Control Column Percent	Column Percent Difference
	Pre		
0	12	18	
	66.7	78.3	+ 11.6
1	6	4	
	33.3	17.4	- 15.9
2	0	1	
	0	4.3	+ 4.3
Totals	18	23	
Chi Square = 2.02	2 df	Sig. = .3642	
	Post		
0	11	20	
	61.1	87.0	+ 25.9
1	5	2	
	27.8	8.7	- 19.1
2	2	1	
	11.1	4.3	- 6.8
Totals	18	23	
Chi Square = 3.68	2 df	Sig. = .1591	

TOTAL ACCIDENTS
17-25 YEAR OLDS

Number of Accidents	Pre Control Column Percent	Post Control Column Percent	Column Percent Difference
0	44	44	
	67.7	67.7	0
1	17	19	
	26.1	29.2	+ 3.1
2	4	2	
	6.2	3.1	- 3.1
Totals	65	65	
Total Accidents	25	23	8% reduction

Chi Square = .78 2df NSD

TOTAL ACCIDENTS
26-33 YEAR OLDS

Number of Accidents	Pre Control Column Percent	Post Control Column Percent	Column Percent Difference
0	93	91	
	74.4	72.8	- 1.6
1	27	26	
	21.6	20.8	- .8
2	5	8	
	4.0	6.4	+ 2.4
Totals	125	125	

Chi Square = .73 2 df NSD

TOTAL ACCIDENTS
34-41 YEAR OLDS

Number of Accidents	Pre Control Column Percent	Post Control Column Percent	Column Percent Difference
0	24	27	
	66.7	75.0	+ 8.3
1	12	9	
	33.3	25.0	- 8.3
Totals	36	36	
Total Accidents	14	10	39% reduction

Chi Square = .73 1df NSD

TOTAL ACCIDENTS
42-65 YEAR OLDS

Number of Accidents	Pre Control Column Percent	Post Control Column Percent	Column Percent Difference
0	18	20	
	78.2	87.0	+ 8.7
1	4	2	
	17.4	8.7	- 8.7
2	1	1	
	4.3	4.3	0
Totals	23	23	

Chi Square = .77 2 df NSD

TOTAL ACCIDENTS
42-65 YEAR OLDS

Number of Accidents	Pre Experimental Column Percent	Post Experimental Column Percent	Column Percent Difference
0	12	11	
	66.7	61.1	- 6.6
1	6	5	
	33.3	27.8	- 4.5
2	0	2	
	0	11.1	+11.1
Totals	18	18	

Chi Square = 2.13 2 df NSD

CONTROL PRIVATE ACCIDENTS
17-25 YEAR OLDS

Number of Accidents	Pre Control Column Percent	Post Control Column Percent	Column Percent Difference
0	45	49	
	70.8	75.4	+ 5.4
1	19	16	
	29.2	24.6	- 5.4
Column Total	65	65	
Total Accidents	22	18	18% reduction

Chi Square = .43 1df NSD

PRIVATE ACCIDENTS
26-33 YEAR OLDS

Number of Accidents	Experimental Column Percent	Control Column Percent	Column Percent Difference
		Pre	
0	81	99	
	82.7	79.2	- 3.5
1	14	22	
	14.3	17.6	+ 3.3
2	3	4	
	3.1	3.2	+ .1
Totals	98	125	
Chi Square = .46	**2 df**	**Sig. = .7952**	
		Post	
0	80	95	
	81.6	76.0	- 5.6
1	16	25	
	16.3	20.0	+ 3.7
2	2	5	
	2.0	4.0	+ 2
Totals	98	125	
Chi Square = 1.30	**2 df**	**Sig. = .5228**	

PRIVATE ACCIDENTS
34-41 YEAR OLDS

Number of Accidents	Experimental Column Percent	Control Column Percent	Column Percent Difference
	Pre		
0	28	29	
	80.0	80.6	+ .6
1	6	7	
	17.1	19.4	+ 2.3
2	1	0	
	2.9	0	- 2.9
Total	35	36	

Chi Square = 1.08   2 df   Sig. = .5826

Number of Accidents	Experimental Column Percent	Control Column Percent	Column Percent Difference
	Post		
0	31	30	
	88.6	83.3	- 5.3
1	4	6	
	11.4	16.7	+ 5.3
Totals	35	36	

Chi Square = .09   1 df   Sig. = .7694

PRIVATE ACCIDENTS
42-65 YEAR OLDS

Number of Accidents	Experimental Column Percent	Control Column Percent	Column Percent Difference
	Pre		
0	16	20	
	88.9	87.0	- 1.9
1	2	3	
	11.1	13.0	+ 1.9
Totals	18	23	
Chi Square = .09	1 **df**	**Sig.** = .7696	
	Post		
0	13	21	
	72.2	91.3	+ 19.1
1	4	2	
	22.2	8.7	- 13.5
2	1	0	
	5.6	0	- 5.6
Totals	18	23	
Chi Square = 2.98	2 **df**	**Sig.** = .2250	

BUSINESS MILEAGE DISTRIBUTION

Mileage Category	Experimental Column Percent	Control Column Percent	Column Percent Difference
1	69	94	
	36.5	37.8	+ 1.3
2	85	99	
	45	39.8	- 5.2
3	35	56	
	18.5	22.5	+ 4
Total	189	249	

Chi Square = 1.56 2 df Sig. = .4594

PRIVATE MILEAGE DISTRIBUTION

Mileage Category	Experimental Column Percent	Control Column Percent	Column Percent Difference
1	136	163	
	72	65.5	- 6.5
2	49	78	
	25.9	31.3	+ 5.4
3	4	8	
	2.1	3.2	+ 1.1
Total	189	249	

Chi Square = 2.22 2 df Sig. = .3302

CONTROL BUSINESS ACCIDENTS PRE
BY BUSINESS MILEAGE CATEGORIES

Number of Accidents	1 Number Column Percent	2 Number Column Percent	3 Number Column Percent
0	93	92	54
	98.8	92.9	96.4
1	1	7	2
	1.1	7.1	3.6
Total	94	99	56

Chi Square = 4.55   2 df   Sig. = .1028

EXPERIMENTAL BUSINESS ACCIDENTS PRE
BY BUSINESS MILEAGE CATEGORIES

Number of Accidents	1 Number Column Percent	2 Number Column Percent	3 Number Column Percent
0	65	71	32
	94.2	83.5	91.4
1	4	12	3
	5.8	14.1	8.6
2	0	2	0
	0	2.4	0
Totals	69	85	35

Chi Square = 5.68   4 df   Sig. = .2241

CONTROL BUSINESS ACCIDENTS POST
BY BUSINESS MILEAGE CATEGORIES

Number of Accidents	1 Number Column Percent	2 Number Column Percent	3 Number Column Percent
0	89	99	54
	94.7	100	96.4
1	5	0	2
	5.3	0	3.6
Totals	94	99	56

Chi Square = 5.15 2 df Sig. = .0763

EXPERIMENTAL BUSINESS ACCIDENTS POST
BY BUSINESS MILEAGE CATEGORIES

Number of Accidents	1 Number Column Percent	2 Number Column Percent	3 Number Column Percent
0	66	80	34
	95.7	94.1	97.1
1	3	5	1
	4.3	5.9	2.9
Totals	69	85	35

Chi Square = .5438 2 df Sig. = .7629

CONTROL PRIVATE ACCIDENTS PRE
BY PRIVATE MILEAGE CATEGORIES

Number of Accidents	1 Number Column Percent	2 Number Column Percent	3 Number Column Percent
0	132	57	5
	81.0	73.1	62.5
1	28	17	3
	17.2	21.8	37.5
2	3	4	0
	1.8	5.1	0
Total	163	78	8

Chi Square = 4.94   4 df   Sig. = .2932

EXPERIMENTAL PRIVATE ACCIDENTS PRE
BY PRIVATE MILEAGE CATEGORIES

Number of Accidents	1 Number Column Percent	2 Number Column Percent	3 Number Column Percent
0	115	37	3
	84.6	75.5	75.0
1	17	10	1
	12.5	20.4	25.0
2	4	2	0
	2.9	4.1	0
Total	136	49	4

Chi Square = 2.47   4 df   Sig. = .6503

CONTROL PRIVATE ACCIDENTS POST
BY MILEAGE CATEGORIES

Number of Accidents	1 Number Column Percent	2 Number Column Percent	3 Number Column Percent
0	127	62	6
	77.9	79.5	75.0
1	30	16	1
	18.4	20.5	12.5
2	6	0	1
	3.7	0	12.5
Totals	163	78	8

Chi Square = 5.63   4 df   Sig. = .2283

EXPERIMENTAL PRIVATE ACCIDENTS POST
BY MILEAGE CATEGORIES

Number of Accidents	1 Number Column Percent	2 Number Column Percent	3 Number Column Percent
0	120	36	3
	88.2	73.5	75
1	13	12	1
	9.6	24.5	25.0
2	3	1	0
	2.2	2.0	0
Totals	136	49	4

Chi Square = 7.28   4 df   Sig. = .1219